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YOUR DIET FOR LONGER LIFE

by

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Preface

DURING the past year the author received more than 100,000 letters from persons in many eastern states, asking for reliable information on food, nutrition, and health.

It was possible to answer only about 3,500 of these interesting inquiries. The replies were necessarily brief and succinct, because they were given over two popular radio programs, one originating daily in New York, the other presented tri-weekly throughout New England.

This book is, therefore, intended as a more complete, practical, authoritative, and non-technical review of the modern knowledge of food and nutrition, a subject of vast significance to everyone. It tells the general reader, as clearly as possible, what we have learned from experience that he actually wants to know, as well as some other things that he should know about this important subject.

The text is, furthermore, based on the author's experience of more than thirty years as a public health official and health educator, as a scientist and executive in the American food industry, and as an officer in two World Wars who was concerned not only with the proper feeding of troops but was also interested in the problems of sustenance of large populations in Europe.

The material in the book is assembled only from the findings of reputable scientists, whose methods and reports are both orthodox and authentic, and free from all fads, fancies and similar follies.

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CHAPTER 1

One Way to Prolong Life

FOR COUNTLESS AGES man has sought to solve the mystery of eternal youth and longer life. In ancient days he asked this favor of his gods, but the gods were reluctant to bestow it. In later times he looked for it in the magic of the philosopher's stone and the elixirs of the alchemist. But always the secret eluded him. Always, that is, until recently.

When the Spanish adventurer, Juan Ponce de Leon, sailed north from Puerto Rico one day in 1513 he was sailing in quest of Bimini, the fabulous fountain of youth. On Easter Sunday, *Pascua Florida,* he sighted a fair land which he named Florida in honour of the day. He failed, however, to find the mystical fountain and continued his search for eight years, in the meantime having received an appointment from King Ferdinand as governor of the "island" of Florida. In 1521 the natives, even more ferocious then than now, mortally wounded him and he died in Cuba at the untimely age of sixty-one.

If Ponce de Leon could only have deferred his visit to America for four and one-third centuries he might have been more successful in his quest for the fountain of youth. In the sixteenth century Spain of his time the average length of life is estimated to have been only about thirty years. Today in America it is more than double that. The march of civilization, guided by science, has brought about longer and better lives.

Yes, modern science has demonstrated that life can be extended. It has shown, furthermore, that these

longer lives can be made more useful, enjoyable, and profitable. These accomplishments have been brought about by a combination of circumstances, by improvements in hygiene and sanitation, by advances in social and economic conditions, by better nutrition. Most of all in recent years it is an optimum daily diet which is the primary factor in conferring these unique benefits.

Authorities on nutrition who have devoted their lives to studies on the effects of diet on human existence assure us that the right food throughout life will positively promise us the following significant advantages *:

A better start in life
A higher level of health at all ages
Lower death rates at all ages
An increase in the expectation of life
An extension of the prime of life
Fewer years of dependency

Who could deny that these are goals worth striving for? Never in the past has the average span of life in any part of the world reached the proverbial threescore years and ten, although in recent years it has approached that average. Many individuals exceed this allotted time, of course, but not the average of all lives.

By continuous application of the known principles of nutrition and diet, which will be fully set forth and explained in the chapters that follow, human life can be definitely prolonged and improved.

Nutrition and diet, by the way, are not one and the same thing. Nutrition is a bodily process, the act of nourishment or being nourished, whereas diet is a regi-

* The Science of Nutrition. Papers presented at meetings of the Nutrition Foundation, November 13 and 14, 1946. The Nutrition Foundation. New York. 1946.

men of food, what is habitually eaten in order to provide nutrition and nourishment.

Before we examine the newest knowledge of nutrition in some detail, let us look for a moment at the interesting record of life extension and consider the factors concerned in it.

The Average Duration of Life

"The days of our years," said the Psalmist, "are threescore years and ten: and if by reason of strength they be fourscore years, yet is their strength labor and sorrow: for it is soon cut off and we fly away."

More generous than this oft-quoted passage from the 10th verse of the 90th Psalm, however, is the less well known axiom of the prophet Isaiah (LXV: 20). "There should be no more an infant of days," he admonishes us, "nor an old man that hath not filled his days, for the child shall die an hundred years old."

To live to be one hundred is a good principle, provided that you can enjoy life while doing it, but few persons today and even fewer in antiquity have been able to perform this feat. In the days of the prophet Isaiah, some 2,600 years ago, the average duration of life is reliably estimated to have been less than thirty years. It is no more than that today in certain parts of the world.

A century ago the average length of life in the United States was less than forty years. Today it is approximately sixty-six years. Thus in the comparatively short period of one hundred years, as time is measured, we have been able to increase longevity in this country by a full quarter of a century. Most of this remarkable increase has occurred, furthermore, in the last few decades, in the period when our scientific knowledge of nutrition has been developed. In 1900, for example,

the expectancy of life at birth in this country was only about forty-nine years; in 1920 it was about fifty-six years; and a decade later, in 1930, it had approached, but only approached, sixty years.

At this point a word of explanation is in order. When we speak of the "average" duration of life it does not mean, of course, that all lives must end at the age given, now sixty-six years. Obviously, many persons survive to much greater ages. What is meant is that the preventable deaths in infancy and in childhood, in early adult life and middle age are all balanced against those which occur at the older ages. The resulting figure is the *average* for the present mortality at all ages from birth to the end of the human career. If you can reduce the deaths in the earlier ages, as you can, then the average rises, as it has risen.

Any person who has reached the average terminal age of sixty-six years actually has a life expectancy of another dozen years or so, according to the life tables compiled by the experts. Even at eighty, or four-score years, the individual may normally expect to live another five years.

What is the present limit of life expectancy? Most scientists believe that human life can seldom exceed one hundred years. Occasionally there is reported a life well beyond this figure, but most of the famous old persons of history have been shown on investigation not to have been as old as reputed. A few scientists claim that human life could extend beyond the century mark, even as high as 150 years, but this remains to be proven.

Most of our present gains in the average span of life have been achieved by preventing, or postponing, death in the earlier ages. At the beginning of the twentieth century our mortality among infants stood at the disgraceful figure of one hundred deaths under one year of age out of each 1,000 live births. Today, infant

mortality in the United States is less than one-third of that amount.

Food is primarily responsible for this improvement, although it has been sanitation of food as well as its nutritive virtues that should be credited for this gratifying achievement. Pasteurization of market milks and production of cleaner and better milk supplies, improvements in the nutrition of pregnant and nursing mothers, better hygiene generally, greater education of mothers and advances in medical, nursing, and sociological care all have been factors in reducing infant and maternal mortality. By the application of the right diet it can be further reduced.

The childhood diseases, which afflicted so many of our young people in the past, are also on the way out. As one example only, consider tuberculosis, or consumption, a malady always associated with malnutrition and poverty. At the turn of the century this disease caused approximately 200 deaths per 100,000 population. Today it takes a toll of only forty deaths per 100,000 persons, and only thirty in the white population. There is no reason why tuberculosis should not cease to exist in our time.

As a result of the triumphs of sanitary science over so many of the communicable diseases, a distinct change has occurred in the nature of our population. We are fast becoming an older and more mature people. In 1900, for instance, less than one-fifth of the American people were forty-five years of age or more, whereas today more than one-quarter of the people have reached or passed this age. More are also attaining to the age of sixty-five, the number having increased from some 4 per cent in 1900 to 7 per cent at present.

With this change in our age characteristics has come a change in the national mortality. In 1900 tuberculosis and pneumonia were the leading causes of death

in the entire population. Today these two infectious diseases have fallen to seventh and sixth places, respectively, and the newer chemical and biological methods of treatment, such as the sulfa drugs and penicillin and streptomycin, should further diminish these plagues, while proper nutrition will aid materially in their prevention.

Our leading causes of death now are heart diseases, cancer, cerebral hemorrhage, violence, and kidney troubles, in that order. Then come pneumonia and tuberculosis, followed by diabetes. Arteriosclerosis, or hardening of the arteries, has also entered the list of the first ten causes of mortality in this country. Some of these degenerative diseases of later life, which now have supplanted the communicable diseases, can definitely be forestalled by the right diet throughout life.

The remarkable public health efforts of the past, in which it has been my privilege to play a humble role, have been aimed chiefly at the control of the environment, the sanitation of our surroundings. Sanitarians have given us pure water supplies, safe milk, clean and hygienic foods, proper methods of sewage and waste disposal, better housing, and more effective public health, medical, nursing, and hospital care.

These salutary procedures never can be relaxed, but must be continued and expanded. The efforts of the future must, nevertheless, be directed more and more toward the promotion of positive health. Modern science has shown that the best and most effective way to the achievement of buoyant rather than merely passable health is through diet, optimum diet. There are, of course, other important factors in the attainment of health and the happiness which goes with it, but none is more significant than adequate nutrition.

Diet and the Duration of Life

How do we know that diet can increase life and at the same time make it more attractive? The evidence that proves this to be an indisputable fact comes both from the pages of human experience, and from the laboratories of the scientists.

In the laboratories of the Department of Chemistry at Columbia University in New York is a famous family which has demonstrated the influence of proper food on longevity*. Investigations on the dietaries of this family have, in fact, now been conducted for about sixty-five generations. That is a long time. How long it is may be computed from the fact that the first colonists in America came only some eleven or twelve generations ago. The discovery of Florida by Ponce de Leon was only fourteen or fifteen generations ago.

This family has been thriving throughout its long existence on a diet of bread and milk, with a little salt and water. When this daily fare consists of five-sixths whole wheat and one-sixth whole milk, the members of the family are well satisfied and well nourished. They reproduce, nurse and rear their young, live healthful lives, and attain to reasonable old ages. This, then is an adequate daily diet, one which contains all the nutrients, or food factors, needed.

When, however, the amount of milk in this regimen is increased from a proportion of one-sixth to one-third a remarkable change takes place. The members of the family then live on the average 10 per cent longer. Not only that, but the prime of life is extended. This prime,

* See Sherman, H. C.: The nutritional improvement of life. *Journal of the American Dietetic Association*, Vol. 22, No. 7, July, 1946.

or period of fresh, full vigor, beauty and power, begins sooner and lasts longer on the new diet.

In other words, by changing the proportion of one food in this subsistence of an entire family, an adequate diet has been converted into an optimum diet.

Further investigations have revealed that the specific food factors chiefly responsible for this improvement in longevity and in general health are two vitamins, vitamin A and riboflavin, and the food-mineral calcium. These important nutrients will be described more fully in subsequent chapters.

This celebrated family consists, of course, of laboratory animals, the white rats whose nutritional requirements are virtually the same as those of man. Obviously, no one scientist could investigate the food habits of a human family for sixty-five generations, which would be equivalent to all the years in the entire Christian era, nearly 2,000 of them.

We can, however, study the effects of food on the white rat, because this animal not only has the same requirements as we do, but it lives thirty times as fast. Thus, one year in the life of a rat is equivalent to thirty years of human life. The results that we get may, furthermore, be translated into human terms.

If, then, 10 per cent can be added to the length of life of a laboratory animal by means of the right diet, this means that about seven years could be added to the average duration of life in this country if all of the people would intelligently apply the present knowledge of nutrition. The research of the future may reveal even better ways to prolong human life.

But, you may say, a rat is not a man and is not likely to become one. This is quite true, but the experiments and tests on appropriate laboratory animals have been confirmed by clinical observations on man, and by studies on groups of persons in various parts of

the world. Thus, in 1929 a California physician, Dr. Lovell Langstroth, carefully investigated the dietary histories of some 500 of his patients and reached the conclusion that degenerative diseases after age thirty were much more frequent in those who had lacked an abundance of protective foods in their previous diets.

The influence of poor nutrition on premature aging has also been studied at the Hillman Hospital at Birmingham, Alabama. Although no definite scientific conclusions are reported, it is pointed out by the director of this famous clinic, Dr. Tom D. Spies, that malnourished persons display more marked evidences of premature aging and senile decay than do similar hard working individuals in those regions where diets are more bountiful.

Such observations are by no means confined to the United States. In a remote part of the Himalaya Mountains is an isolated tribe with a magnificent physique, the members of which seem to have found that elusive fountain of youth, since they retain late in life the characteristics of youth. As reported by Dr. Robert McCarrison of the British Medical Service, these rugged peoples subsist on a frugal diet of goat's milk and vegetables. Goat's milk, by the way, has no nutritive virtues not possessed by cow's milk, or combinations of other foods.

In Kenya in Africa British medical officers examined the health and physique of two neighboring tribes, the Masai and the Akikuyu. One of these tribes, the Masai, lives almost exclusively on milk and meat, while the other subsists mainly on cereals and a few vegetables. And what is the result? The full-grown Masai man is taller, heavier, stronger, and less prone to disease than the Akikuyu. The same superiority is exhibited by the female members of the milk-and-meat-fed tribe.

Experiences such as these could be multiplied many

times over, if space permitted. Coming back home again, however, investigations in the laboratories at Cornell University have shown that animals given food mixtures extraordinarily rich in vitamins and proteins will live longer lives if growth is somewhat retarded. So long as necessary nutrients are present in the diet, undernutrition has a more favorable effect than overnutrition. Let us see how this applies to humans.

Your Weight and the Duration of Life

Your belt line has a real and substantial influence on your life line. Statistics show that persons who are grossly overweight after the age of forty tend to live shorter lives than those whose weight is normal. A rule that is sometimes quoted is that for every inch the waist line exceeds the chest measurement, you can subtract two years from the life expectancy.

The greater the degree of overweight, the less favorable are the chances for healthful longevity. In early life a slight amount of excess fat does no harm and even may be advantageous, but after middle age, obesity is distinctly detrimental to health. Thus, persons who are 35 per cent or more above the average weights for their heights and ages have one and a half times the mortality of the normal weight individuals. Even persons who are only slightly overweight show a little higher mortality than those whose weight is about the average.

In overweight persons certain serious physical defects are much more common, and much more dangerous, than in those who are more sylphlike in their physiques. In diabetes, for example, the death rate is two and one-half times as high among overweights as among normal weights, and four times higher in overweights than in those who are under weight. High blood

pressure is likewise two and one-half times as common among the obese as it is among those who have normal weights. Heart diseases, kidney troubles, and cerebral hemorrhages are all much more prevalent in the overweight.

The most dangerous kind of obesity is the flabby, pot-bellied variety. Big persons with long trunks and short legs do better in the mortality tables when their fat is well distributed over the body and not concentrated in the front and centre.

Although Julius Caesar in Shakespeare's play asked to have about him men that are fat, "sleek-headed men, such as sleep o'nights," the dangers of fat were ably expressed some 2,500 years ago by Hippocrates, the Father of Medicine.

"Fat men," he said, "are more likely to die suddenly than the slender."

Modern science has confirmed many of the aphorisms of Hippocrates, but none more cogently than this one.

QUESTIONS

It is always interesting to test your knowledge. If you can answer satisfactorily most of the following questions, and those given in various other places in this book, you can rate yourself as proficient in the science and art of nutrition. Some of these questions are quite simple, while others are more difficult, but all bring out important facts which are worth knowing, worth thinking about, and worth applying in your daily regimen of life. The answers are, of course, given in the text.

1. Complete the missing parts of the following sentences.

The right food throughout life will positively promise us the following significant advantages:

A better .....
A higher .....
Lower .....
An increase in.....
An extension of .....
Fewer .....

Answers on page 2.

2. The average length of life in the United States is now about forty years ...., fifty-five years ...., sixty-six years ...., seventy-two years .... *See page* 3.

3. Since 1848 the average span of life in this country has increased by .... years. *See page* 3.

4. What is actually meant by the "average" duration of life?

5. Many diseases which are now the leading causes of death could be forestalled by proper nutrition throughout life. Put the number of its rank in the American mortality tables beside each of the following:

Diabetes .....
Pneumonia .....
Heart diseases .....
Violence .....
Tuberculosis .....
Cancer .....
Cerebral Hemorrhage .....
Kidney troubles .....
Arteriosclerosis .....

Answers on page 6.

6. In 1900 less than one-fifth of our population was forty-five years old. Today, about one-fifth ...., one-quarter ...., one-half ...., of the people are forty-five or over. *See page* 5.

7. Experiments with laboratory animals have demonstrated that an optimum daily diet will increase their length of life by 1 per cent ...., 5 per cent ...., 10 per cent ...., 20 per cent .... *See page* 7.

8. Assuming, as you can, that this principle applies to the human race, how many years could be added to the average duration of life by an optimum daily diet? *See page* 8.

9. Is it true or false that the dietary factors mainly responsible for this increase are:

	True	*False*
Iron	.....	.....
Silicon	.....	.....
Vitamin C	.....	.....
Calcium	.....	.....
Vitamin A	.....	.....
Iodine	.....	.....
Riboflavin	.....	.....
Water	.....	.....

Answers on page 8.

10. For every inch that your waist measurement exceeds your chest measurement, you can subtract .... years from your life expectancy. *See page* 10.

11. Check the diseases below which are likely to be much more prevalent in grossly overweight persons:

Smallpox	.....
Diabetes	.....
Diphtheria	.....
Kidney disease	.....
Heart troubles	.....
Colds	.....
High blood pressure	.....
Psoriasis	.....

Answers on page 11.

12. What is the most dangerous kind of obesity? *See page* 11.

CHAPTER 2

The Rules for Right Eating

TO THE AVERAGE PERSON the science of nutrition may seem complicated and rather formidable, but it is really quite simple when applied in a practical manner to the daily problem of eating. To be sure, our newer knowledge of nutrition has been laboriously built up over the course of the years from the investigations of many thousands of scientists, chemists, biochemists, physicians, dietitians, agriculturists, and home economists in all parts of the world. It can, however, be translated into terms that anyone can comprehend.

This accumulated wisdom on how to eat may, in fact, be summed up in just one simple short sentence, as follows:

Build your daily diet around liberal amounts of the basic and protective foods; then eat what you want, so long as what you eat is adequate and maintains normal weight, and the foods selected are wholesome and agree with you, and are properly prepared.

Now, this general statement obviously requires some explanation and enough elaboration to justify a whole book on the subject. What, for example, are the "basic" and "protective" foods referred to, and why are they so valuable? What is meant by using "liberal" amounts of them? What is an "adequate" diet? How does one maintain "normal" weight? Why is it that some foods do not agree with certain people? How should foods be selected and prepared so as to get the most good out of them?

The terse rule for right eating given above applies

to everyone, but it applies best to the normal person. Here again, we have to stop and ask, what is a normal person? All men may be created equal, as the proverb says, but they certainly are not physically and mentally the same. What they are depends partly upon their heredity and partly upon their environment, the latter having the power to modify the former to a considerable extent. Your diet is part of your environment, since your food supply comes from the outside and enters your internal environment, where the way in which it is utilized may be influenced by your inherited characteristic.

The precise dietary requirements of any one person are, therefore, contingent upon his or her own peculiar physical make-up, and also upon his or her status in life. For one thing, the age of the individual governs the nature of his diet, although it does not alter the general principles of it. The infant must have certain types of appropriate foods, the school child still other types, while the requirements of the adult are more standard in character but depend upon his physique, his activity, his defects and maladies if any, the climate, and numerous other factors. In the case of women such natural events as pregnancy and lactation impose additional nutritive requirements. In old age the food needs are different from those of youth and middle age. In illness the diet often varies from that in health.

Despite the inherent differences in individuals and in their modes of life, the general principles of good nutrition are the same for everyone. It is not difficult to apply them in order to eat sanely and sensibly, nor is it expensive to do so. The facts are available, their application is merely a matter of knowledge and common sense. So, let us see what are these well-established principles.

Practical Nutrition

Compared to most other sciences the science of nutrition is new. Its foundations were laid more than a century ago, but the most spectacular advances in this science have all occurred within the last twenty-five years or so. These new discoveries in the field of nutrition seem to have come as fast as corn popping in a pan.

Before 1915, for example, no one had ever heard of those mysterious food factors known as vitamins, although there had been clues to their existence long before that time. Prior to 1915 scientists recognized that food contained such things as fats, carbohydrates, proteins, mineral matter, and water, but they had not broken down these substances into their chemical constituents to any extent.

Since that time more than twenty different vitamins have been discovered and catalogued, and a number of them have been duplicated by artificial means, that is, made synthetically in the laboratory. The proteins have been divided into their amino acids and the fats into their various component parts. The functions of a dozen minerals in nutrition have been investigated. What is even more important, the interrelationships of these various nutrients have been worked out, more or less.

A few skeptics are sometimes heard to say, "What did we do before all this folderol was known about diet, anyway? Our grandparents got along all right without it, didn't they?" To which the retort is, no they didn't.

In the good old days before the development of the newer knowledge of nutrition the death rate was very much higher than it is today, the infant and maternal mortality rates far exceeded those of the present, and

many people in the horse and buggy era suffered from such preventable afflictions as scurvy, rickets, anemia, chlorosis, beriberi, pellagra, goitre, and numerous other conditions which are due to dietary deficiencies. No, the good old days were not always so good.

The vitamins have received a great deal of sensational publicity, mostly because of the dramatic features of their discoveries and the melodramatic aspects of their properties, but the vitamins are only one part of the complete story of nutrition. They are important, of course, but they are no more important to life and health than are certain other essential nutrients. Man can not live by vitamins alone; neither can he live without them. A nutrient, by the way, is defined as a substance which furnishes necessary nutriment or nourishment to the body.

In order to be properly nourished the body must be supplied regularly with the following thirty-four or more nutrients:

1. A source or sources of glucose, the sugar of the blood, derived mainly from carbohydrates, and required for the energy needs of the body.
2. Ten of the amino acids which make up the proteins in foods.
3. At least ten of the minerals.
4. Two substances from fats, linoleic and arachidonic acids.
5. Ten or a dozen of the known vitamins, possibly more.
6. Water.

The human body, you know, is a machine, the most remarkable and intricate of all mechanisms. Like all machines, it runs on fuel, which must be supplied in the foods that we eat. This fuel, this food-energy comes mainly from fats and carbohydrates, and to a lesser extent from the proteins in our foods.

Like all machines, the body is subjected to wear and tear. It must be constantly rebuilt and repaired as the tissues are worn down and depleted. In addition to sources of energy, therefore, foods must furnish building materials for the body. These are provided by the amino acids in our protein foods.

The word "protein" comes from the Greek and means "to take first place." The early investigators in the field of nutrition thought that these proteins were the most important factors in the daily diet. That was long before a vitamin had even been dreamed of. We know today that protein certainly is important, but that it, like the vitamins, is only one part of the full story of nutrition.

The human machine is constructed out of soft tissues and hard bones, comprised of about a score of chemical elements in an almost infinite variety of combinations. Most abundant of these elements is oxygen (65 per cent), followed by carbon (18 per cent), hydrogen (10 per cent), and nitrogen (3 per cent). Oxygen is especially prominent because about two-thirds of the body by weight is composed of water (H_2O). The tissues are made up largely of carbon and nitrogen compounds, sometimes with a little sulfur and phosphorus.

The bones are comprised mainly of calcium and phosphorus, although together these two minerals represent only about 2½ to 3½ per cent of the composition of the body. Many other minerals, iron, copper, iodine, sodium, chlorine, magnesium, etc., are also necessary to various bodily processes, but most of them are present in relatively small amounts. Iodine, for example, constitutes only about 4/100,000 of 1 per cent of the entire body, but that tiny amount is very important.

In one day the average person loses from the body

nearly an ounce of these various minerals. He must replenish his supply from the food that he eats, and possibly in other ways, as by the direct use of common salt (sodium chloride) as a condiment. If that salt is iodized, as all salt should be, he gets another important mineral, iodine, along with it.

So far, then, we have seen that the body requires for its nourishment fuel, or food-energy, proteins for repair, and minerals to build bones and teeth and to perform various other functions. The vitamins now complete the picture. These invisible chemical substances occurring in natural foods may be compared to the sparkplugs of the machine, although this analogy is more picturesque than exact. The vitamins do, however, give it vigor and vitality, sometimes directly and sometimes by working upon or stimulating other substances in the body.

Although the vitamins are generally considered as a group, and they will be described together in one later chapter, actually they are not a class or a system. Each one of the twenty or more known vitamins differs from each of the others, not only in chemical composition but in performance. They are decidedly individualistic, but they frequently team up and work in harness in the human system.

If the body is deprived of any one of the vitamins, disease always results. Among these vitamin deficiency diseases are night blindness, beriberi, pellagra, scurvy, rickets, nutritional anemia, and a tongue-twisting malady known as ariboflavinosis. All of these are, of course, quite different from the contagious and infectious diseases which are caused when the body is invaded by specific organisms, or germs and viruses.

The vitamins do much more than protect the body against the deficiency diseases. They play a definite role in many important body functions. They are, consequently, most significant factors in the promotion of

positive health.

Good nutrition rests four-square on these four food factors, energy, protein, vitamins, and minerals. All are equally important. You can not dispense with any one of them and be well-fed. You can not glorify one of them at the expense of the others. Finally, these four factors, and perhaps others, must be so balanced in the diet of the individual as to give him the most effective kind of good nutrition.

In addition to these four kinds of nutrients the body also requires fluids to serve as carriers, solvents, and regulators. Water itself is not a nutrient in the sense that it confers any vitamins, energy, or proteins, but it is essential to life, since all of the cells are bathed in it. Occasionally water may contribute some minerals to the diet, but the minerals in water are not as valuable as those in foods.

The Nature of Foods

Foods, as everyone knows, consist of grains, vegetables, meat, fish, dairy products, eggs, fruits, nuts, and various other comestibles. They can also be classified, somewhat roughly, as fats, carbohydrates, and proteins. Thus, butter and oils are almost pure fats, refined sugar is practically 100 per cent carbohydrate, and gelatin is a pure protein.

Most foods are, however, mixtures of two or three of these food substances, and also contain some mineral matter and considerable water. Whole milk, for example, has fat, carbohydrate, and protein in somewhat similar proportions, together with minerals, vitamins and about 88 per cent water. The egg is another food which contains all of the food elements.

In many victuals some one of the three types of nutriment may predominate. Thus, potatoes and cereals

are mainly starch and are consequently known as starchy foods. Vegetables, with a few exceptions, are rich in carbohydrates, while meats, fish, and dairy products are regarded as protein foods. A few vegetables, such as the legumes, are likewise good sources of protein. Fruits are comprised mainly of carbohydrates, while nuts are rich in fat and protein. There are, of course, occasional exceptions to all of these general classifications.

All of these substances, the fats, carbohydrates, and proteins, contribute to the food-energy values of the diet. Fat, being more concentrated, yields more than twice as much food-energy as do the proteins and carbohydrates, which yield the same. The fats and carbohydrates are made up entirely of the elements, carbon, hydrogen, and oxygen, while proteins contain these plus nitrogen, and sometimes sulfur and phosphorus. It is the nitrogen in the proteins which helps to build the cells of the body.

Minerals and vitamins in foods vary greatly. Pure sugar, for example, contains no vitamins or minerals at all, and gelatin has none. Butterfat, on the other hand, is rich in one vitamin, that known as vitamin A. Whole milk has practically all the known vitamins, although a few of them are rather skimpy. Along with milk, examples of foods plentifully supplied with a host of vitamins are liver, eggs, and yeast. Fruits are usually rich in one vitamin, ascorbic acid or vitamin C, and may have small amounts of a few others.

Because of these facts, the best all-around diet is obtained from a mixture of common foods. In a mixed diet the various nutrients supplement one another and work together. Thus, plenty of fat and carbohydrate in the diet will spare protein, and carbohydrate and fat will spare the vitamin known as thiamine. Fats and certain types of sugars, such as lactose or milk sugar, will stimulate better utilization by the body of the mineral,

calcium, which in turn is caused to deposit properly in the bones by the action of another vitamin, the one known as vitamin D. There are all sorts of interrelationships between the various nutrients. One of the amino acids in proteins, called tryptophane, can more or less take the place of a vitamin known as niacin.

The consumer need not be concerned about these interactions of the various nutrients, so long as his selection of food includes an abundance of certain basic and protective foods. His choice may sometimes be complicated by the fact that certain foods do not agree with him because of an allergy, or sensitivity to one or more particular foods, or for some other physical or emotional reason. If, nevertheless, the consumer knows all about foods and their properties, he can make a proper selection of those which will nourish him.

The Basic and Protective Foods

The term "protective" foods was coined about a quarter of a century ago by Professor E. V. McCollum, one of the leading authorities on nutrition and a discoverer of the vitamins. As a result of his epoch-making studies he reached the conclusion that our diets were most often deficient in calcium and vitamin A. Inasmuch as the foods which best supply these nutrients are pure milk and dairy products and the green leafy vegetables, he suggested that these be called the protective foods.

In later years, as our knowledge of nutrition increased, the term was broadened to include foods replete with other important nutrients, such as fruits, yellow vegetables, eggs, and eventually, enriched bread. Some protagonists of meats have also included liver, and lean meats generally, in this category.

Characterization of these foods as protective foods has served a useful purpose in the past, but the term is no

longer regarded as especially significant. More recent investigations have shown that the American dietary is more likely to be lacking in thiamine, or vitamin B_1, than in vitamin A, and that iron is more often deficient in the average diet than is calcium.

During World War II a new and perhaps better phrase came into current usage. This was the "basic seven food group," a term proposed by the United States Department of Agriculture and the War Food Administration. This list of the foods which experts consider to be necessary or desirable parts of every well-balanced daily diet include the following:

1. Green and yellow vegetables;
2. Citrus fruits, tomatoes, and salad greens;
3. Other fruits and vegetables;
4. Milk, including all its recognized forms other than butter;
5. Meats, fish, poultry, eggs, nuts, and mature legumes, including peanut butter;
6. Breadstuffs and cereals, whole grain, enriched, or restored;
7. Butter and fortified margarine.

With these as the foundation of the diet, you may eat any other wholesome food that you like, within the limits of reasonable weight control.

The Benefits of Good Nutrition

Right eating can do more for you than any other single rule of personal hygiene. Good nutrition must begin, however, at the beginning of life which commences not at the time of birth but approximately nine months before that event. If the infant is to have the proper start in life, the expectant mother must be adequately and correctly nourished, a regimen which also makes birth easier and more successful.

If, then, proper nutrition begins early and lasts long, throughout life, it will assure the individual of strong bones and sound teeth, good muscular development, keen vision, clear skin, a good physique, a quick mind, vital resistance against disease, and general good health and happiness.

As accompaniments to sensible nutrition there must be, of course, observance of other rules of health and hygiene, such as adequate rest and recreation, moderate exercise, personal cleanliness, mental serenity, and intelligent avoidance of communicable diseases, poisons, and accidents. The best diet in the world will not prevent certain contagious diseases, such as typhoid fever, smallpox, syphilis, common colds, influenza, diphtheria, measles, and the like, if an individual is exposed to them, but a proper diet which promotes health will often mitigate their effects. Good nutrition helps to avoid the degenerative, or organic, maladies, and it definitely prevents the dietary deficiency ailments, but those of an infectious nature must be controlled by immunization, hygiene and sanitation, quarantine, and other measures.*

Diet does more than aid in the prevention of certain diseases. Not only does the right food contribute to energy, strength, and vitality, but it promotes fertility, aids in successful reproduction and the nurture and rearing of the young, extends the prime of life, and is conducive to healthful longevity. Good nutrition makes life worth living by conferring upon the consumer the multifold benefits of optimum, or buoyant health.†

* See Tobey, J. A.: *Public Health Law*. 3rd edition. The Commonwealth Fund. New York. 1947.

† Questions on the material in this chapter will be found at the end of Chapter 3.

CHAPTER 3

Energy and Strength from Foods

ONE QUALITY of the human machine distinguishes this remarkable mechanism from all others. It never stops working. From the cradle to the grave, from the very moment of conception, in fact, the human body is constantly spending energy. Only death can interrupt the process.

Even when the human mechanism is at rest, it continues to perform work. The mere act of breathing, and the ceaseless pumping of the heart are activities requiring the expenditure of energy. Other functions of the body likewise are active at all times, whether it is asleep or awake, whether it is busy or quiescent. There is no such thing as real suspended animation in the body. There could not be while it is a living organism.

The actual amount of energy spent by the body depends, of course, upon its daily physical and mental activity. Less energy is required when the system is at rest or relaxed than when hearty manual labour is being performed. As I write, for instance, I am using up heat units in my body at the approximate rate of two or three a minute, despite the fact that I am working calmly and deliberately, and with a certain amount of enjoyment in my work. On the other hand, if I had a close deadline to meet, felt excited about it, and was working feverishly at the typewriter, I should be using up at least twice as many heat units, or calories.

What are Calories?

The expenditure of human energy, as well as the sources of this energy in foods, are both measured by a unit known as the Calorie. Actually, it is a unit of heat, since it is defined as the amount of heat needed to raise one kilogram of water one degree Centigrade. Translated into more familiar household terms, this is the amount of heat required to raise about four pounds of water one degree Fahrenheit.

As applied to the chemistry of foods and nutrition, this calorie is the one known as the large or great Calorie, 1,000 times the small calorie which is employed in many physical measurements. This small calorie is the amount of heat necessary to raise one gram of water one degree Centigrade, or more precisely from 0 to 1 degree, or from 15 to 16 degrees.

In order to distinguish the large calorie from the small, the former is spelled with a capital " C " in scientific literature. In popular literature, this distinction is seldom observed, and will not be followed here. When calories are mentioned, it will be understood that the large calorie is always referred to.

Our food calorie is similar to the British Thermal Unit, or B.T.U., which engineers employ to measure the heat output of engines, motors, and other inanimate machines. One large calorie is, in fact, equivalent to about 4 (3.968) B.T.U.'s. This is, by the way, not the same as horsepower, which is a unit of work, or the amount of work equal to 33,000 foot pounds per minute. Although based on the work of the horse, the figure actually is set about 50 per cent above the amount accomplished by the average work horse.

In order to produce energy and work, a machine must be supplied with an appropriate fuel. The horse and the human must also have fuel for the same purpose. This

fuel is provided by the food that we eat, and its contribution to our energy needs is measured in calories.

When the human body is awake but is lying at rest, and has received no food for the past twelve hours or more, the rate of its expenditure of energy under these conditions is known as "basal energy metabolism." The word "metabolism" means the sum of the chemical changes which are proceeding continuously in the living cells of the body.

In health the basal energy metabolism of a man of average size, about 150 pounds (70 kilograms), will average about 70 calories per hour. In making physical examinations doctors often perform basal metabolism tests in order to help ascertain the condition of the patient. If there is a considerable deviation above or below the average, the fact may be helpful in diagnosis. Women, incidentally, are smaller than men, on the average (about 123 pounds), and generally show a slightly lower basal energy metabolism, usually some 5 per cent less.

If, then, a man did nothing but lie around indolently, spending his energy only at the rate of 70 calories per hour, his requirements for the entire day of twenty-four hours obviously would be 70 x 24, or a total of 1,680 calories for the day. No man does this, however, since even the most languid must eat and perform certain other functions which the individual can do only for himself. The mere act of taking sustenance, and of answering the calls of nature, raises the caloric needs from 70 to about 100 per hour.

A man leading a sedentary life would, therefore, need not less than 2,400 calories a day, as a rule. This is the maintenance diet for the average man, although it is somewhat less for the average woman. People in war-stricken Europe and other parts of the world who have been trying to subsist on 1,100 to 1,500 calories a day

obviously have not been favored even with a maintenance diet.

Although a few persons live sedentary, listless, slothful lives, most do not. Most people labor and toil in offices and factories, in schools and homes, in the quest, sometimes successful and sometimes elusive, for economic security. Some work mainly with their hands, and some with their brains, and some with both, but all spend energy in whatever they are doing.

These working persons need more than a maintenance diet, although exactly how many daily calories they require depends upon how active they are. It is manifest that an individual who sits at a desk all day does not use up as many calories as the individual who works all day as a carpenter or plumber or as a digger of ditches.

For a moderately active man the daily intake of calories from food is generally set at 3,000, while a moderately active woman requires about 2,500. In the case of a very active man, such as a young soldier or a manual worker, the figure rises to 4,500 calories a day. For the very active woman, it is 3,000. Nursing mothers generally need this same amount, but expectant mothers usually can do with less.

Children, when young, do not require as many calories as do adults, since their bodies are small. After the age of twelve or so, active children generally need more calories than the average adult.

The customary daily allowance of calories for persons of all ages and sexes, as recommended by the Food and Nutrition Board of the National Research Council, are given in the accompanying table (Table I).

All of these figures must, of course, be regarded as averages and as guides, rather than as the precise requirement for every individual. The exact number of calories which is most suited to a particular person

TABLE I

Daily Calorie Requirements

	calories
Children	
Under 1 year of age—100 calories per kilogram (2.2 pounds) of weight	
1-3 years	1,200
4-6 years	1,600
7-9 years	2,000
10-12 years	2,500
Girls 13-15 years	2,800
16-20 years	2,400
Boys 13-15 years	3,200
16-20 years	3,800
Men	
Moderately active	3,000
Very active	4,500
Sedentary	2,500
Women	
Moderately active	2,500
Very active	3,000
Sedentary	2,100
Pregnancy (latter half)	2,500
Lactation	3,000

depends not only upon the sex, but also upon such factors as the age, physique or body build, and the amount of daily activity normally indulged in. The climate may also be an added factor, since a few more calories are generally desirable in winter, and somewhat fewer during the hot weather of summer. Here again, though, other elements enter into the picture, such as the amount and quality of the clothes worn, the humidity, the degree of activity, and the kind of food consumed.

How, then, does one determine precisely the best number of calories for his or her own peculiar mode

of life? The appetite may be some indication, but it is not a very reliable one. Maintenance of ideal weight for the age, sex and body build of the individual is probably the best criterion of a proper intake of daily calories, at least in the average person. If your best weight does not fluctuate too much over the course of time, you are eating about the right amount of food.

Tables of average body weights, with explanations, are gives on pages 91 to 96.

Foods as Sources of Calories

All foods furnish calories. There is, however, great variation in the number of calories supplied by the different foods. Weight for weight, the foods rich in fats provide considerably more calories than the leaner foods; similarly, the foods high in natural water content do not yield as many calories as those which are more solid.

Although pure water is essential to life, water itself does not contribute any food-energy value to the diet. All foods contain some water, ranging from about 2 or 3 per cent in the dried foods to as much as 98 per cent in some watery fruits. Most foods are, in fact, more than 50 per cent water, and many excellent viands contain from 80 to 90 per cent natural moisture.

In addition to this water, the solid portions of foods are made up of fats, carbohydrates, and proteins, in all sorts of combinations. They may also contain some minerals, usually around 1 to 2 per cent of the total bulk of the food, but these minerals do not possess any appreciable food-energy value.

The fats are the highest source of food-energy. They offer more than twice as many calories as the carbohydrates and proteins. Thus, the fats give us 9 calories per gram of fat, or about 270 per ounce, a gram being

about 1/30 of an ounce (actually 1/28). The carbohydrates and the proteins each yield 4 calories per gram, or about 120 per ounce.

You can not, however, obtain all your calories from fats. Not only would it be too expensive, but it would not be good for the body. In a well-balanced and adequate daily diet you will usually procure about 20 per cent of the calories from fats of various kinds, both animal and vegetable, both visible and invisible, and about 10 to 15 per cent of the calories from proteins. The remainder, from 65 to 70 per cent, will be obtained from the carbohydrates, the starches and sugars.

These proportions are not an absolute rule, however, since they may vary considerably, and the body will adapt itself to the conditions. Some races, such as the Eskimos, live largely on protein food like meat, although they consume the entire animal, including the organs, in order to have plenty of vitamins and minerals.

It is interesting to note that when 100 calories of each of these food substances, the fats, carbohydrates, and proteins, are taken, they do not produce exactly 100 calories in the body, as might be expected. Instead, the proteins metabolize 130 calories or so, the carbohydrates 106, and the fats 104. This property is known to the scientists as the "specific dynamic action" of the foodstuff. At the first glance, this may look like a gain, but actually it represents a loss of food. If, for example, you were fasting and needed 100 calories of protein, you would have to eat foods containing not 100 but 130 calories of protein. This dynamic action of protein is, moreover, one reason why this type of food is especially valuable in a reducing diet. On an ordinary mixed diet of all classes of foods, the loss of energy generally does not exceed about 6 per cent of the calories, and may safely be disregarded by the consumer.

Computing the Calories

If you know the composition of any food in terms of fat, carbohydrate, and protein, it is a simple matter to compute the number of calories in any given portion. The easiest method is to employ the metric system, as shown in the following illustration.

Let us say that the whole milk from a cow averages 3.9 per cent butterfat, 5.0 per cent lactose, or milk sugar, and 3.5 per cent protein, along with 87.0 per cent water and 0.6 per cent ash, or mineral matter. These percentages mean that in 100 grams of whole milk there would be 3.9 grams of fat, 5 grams of carbohydrate, and 3.5 grams of protein. Since we know the number of calories provided by one gram of each of these, the rest is simple arithmetic, as follows:

Fat, 9 calories per gram times 3.9 equals	35.1
Carbohydrate, 4 calories per gram times 5 equals	20.0
Protein, 4 calories per gram times 3.5 equals	14.0
Total	69.1

In 100 grams of whole milk there are about 69 calories, or 0.69 calories in one gram, which is about 1/30 of an ounce. In one ounce of milk, therefore, there would be 30 x .69, or from 20 to 21 calories, or about 170 in an eight-ounce glass, 340 in a pint, and 680 in a quart.

These figures are not precise, and there is no reason why they should be for all practical purposes. In the first place, not every sample of milk has the average composition given. Some, such as the milk from Guernsey cattle, are much higher in butterfat, often exceeding 5 per cent. Even the milk from one breed of cows, or from an individual cow may vary slightly in composition from time to time.

The consumer need not, of course, go to the trouble

of computing the calories in the various common foods, since that has been done for him by the chemists. In the table in Appendix II (page 274) are shown the calorie values for most foods in regular use.

No one can state positively that he is getting from foods a precise number of calories, such for instance as 2,267 per day. He may be obtaining approximately 2,200 or 2,300, or some other round figure, but there are too many chances of error to be much more explicit than that. Not only does the actual composition of every individual food vary somewhat, but the utilization of the food in the body may vary somewhat, too.

In order to be of practical value our calorie tables show the food-energy figures for common household portions and also the quantity of a food that will yield 100 calories (page 113). Thus, a cup of milk gives 170 calories; in order to get 100 calories, you would need about five ounces of milk. Similarly, one usual square of butter, one-quarter of an inch thick, and an inch and a quarter on each side, would give about 50 calories.

The way in which the calorie values of a day's meals can be ascertained is shown in the following example:

Calories in a Typical Day's Menus

BREAKFAST

	Calories
Orange juice (6-ounce glass)	100
Whole grain cereal (one ounce)	100
Cream for cereal (¼ cup 18.5%)	100
Toast (2 slices)	140
Butter for toast (1 tablespoon)	100
Coffee	0
Cream and sugar in coffee	50
	590

LUNCHEON

	Calories
Crackers and milk:	
Whole milk (1 pint)	340
Graham crackers (5 crackers)	200
Baked apple, with cream and sugar	230
	770

DINNER

Tomato juice (4-ounce glass)	25
Beefsteak (2½ ounces)	200
Potatoes (1 medium baked)	100
String beans (1 cup)	50
Butter on the vegetables	50
Salt and pepper	0
Lettuce salad	10
Dressing on salad	50
Enriched white bread (2 slices)	140
Butter on the bread	100
Milk (1 glass)	170
Apple pie (1 piece)	300
	1,195
Total for day	2,555
Or about	2,600

If a cocktail, prepared from a distilled liquor such as gin, rum, or whiskey, is taken before dinner, the total caloric value of the meal will be increased by from 100 to 150 calories. Alcohol yields food-energy at the rate of seven calories per gram or about 200 to the ounce, being intermediate between the fats and the carbohydrates.

Proteins as Body Builders

Protein foods, as we have seen, contribute energy to the body, but they have a much more important function than that. Unlike the fats and carbohydrates

they contain nitrogen, which is a necessary constituent of every living cell. The body takes what nitrogen it requires from the protein foods in the daily diet, works it over, and finally discards some or all of it in the form of the uric acid and creatinine which are excreted in the urine.

Before the body can utilize this nitrogen, it must break up the proteins into more simple substances. These are the amino acids, the real building blocks of the body, which are carried by the blood to the muscles and other tissues to replace and repair these organs. It is more important that proteins be used for this purpose than for energy, and that is the reason why we get most of our food-energy from the carbohydrates and fats, sparing the proteins for their body-building function.

Twenty-one different amino acids are known, as shown in the following list of picturesque names:

Alanine
Arginine
Aspartic acid
Cystine
Glutamic acid
Glycine
Histidine
Hydroxyglutamic acid
Hydroxyproline
Isoleucine
Leucine
Lysine
Methionine
Norleucine
Phenylalanine
Proline
Serine
Threonine
Tryptophane
Tyrosine
Valine

These twenty-one amino acids occur in all sorts of combinations in the proteins in foods. Not all proteins contain all of them, since some will have only fifteen, sixteen, or seventeen of these amino acids. The quantity of a particular amino acid in a certain body may also be large or small, and this fact may determine the actual food value of that protein.

Of these twenty-one amino acids, only ten are considered to be essential in the sense that they must be provided in the food that we eat. The body can take care of the others, converting some of the more complex ones into simpler ones.

Here, then, is the list of the ten essential amino acids:

Arginine	Methionine
Histidine	Phenylalanine
Isoleucine	Threonine
Leucine	Tryptophane
Lysine	Valine

If a protein in a food contains all ten of these essential amino acids, it is known as a "complete" protein, one which will sustain life. Examples of foods possessing these complete proteins are milk, cheese, eggs, lean meats, and almonds. Some other foods, such as wheat, corn, and soybeans, contain one complete protein, but along with it is an incomplete one. Other foods, such as gelatin, navy beans, and peas, and most vegetables and fruits do not have any complete proteins.

The fact that a food is devoid or low in complete proteins is not necessarily a black mark against it, because it may have other nutritive virtues, and besides, its proteins may be supplemented by those in other foods which are eaten with it. Thus, when bread and milk are taken together, the proteins in each are ideal supplements to one another. The protein deficiencies of the cereals and legumes are compensated for by the liberal use of milk and eggs in the diet.

Our Needs for Protein

How much protein do we need? As previously stated, from 10 to 15 per cent of the daily calories may appropriately be consumed in the form of protein. This

is not the whole story, however, because certain classes of persons may need a more abundant supply. During growth, pregnancy, lactation, convalescence, and vigorous athletic performances the need for protein of good quality is enhanced. A two-year-old child, for example, requires from three to four times as much protein per weight of the child as does an adult. If more is taken than is needed, there is no disadvantage, particularly in the young.

The daily allowance of protein recommended by the Food and Nutrition Board of the National Research Council is 70 grams (2 1/3 ounces) for men, and 60 grams (2 ounces) for women, except during the latter half of pregnancy, when it should be 85 grams, and during lactation, or nursing, when it should be 100 grams. Children under one year of age need 3 to 4 grams per kilogram (2.2 pounds) of weight. From that age on the standards are: 1-3 years, 40 grams; 4-6 years, 50 grams; 7-9 years, 60 grams; 10-12 years, 70 grams. Girls from 13-15 require 80 grams, and from 16-20, 75 grams. Boys from 13-15 need 85 grams, from 16-20, 100 grams of protein a day.

In old age the need for protein is somewhat less than during the earlier years of life. Elderly persons likewise can do with fewer calories, since their activities are less, and there is a natural tendency for the body to lose weight in advanced age.

Deficiencies in the intake of protein do not often occur among the general population in the United States. It is estimated, in fact, that our average per capita consumption of protein amounts to 93 grams per day, which is well above the recommended allowances. This excess does no harm. At one time it was thought that too much meat and other protein foods in the diet was conducive to kidney disease, but modern science has demonstrated that this is not so.

It is not the quantity of protein that should concern the modern American consumer, but its quality. The inclusion in the daily diet of liberal amounts of pure milk, cheese, eggs, lean meats, and other protective and basic foods is assurance of an adequate supply of the necessary body-building proteins.

QUESTIONS

1. Fill in the missing parts of this statement, which sums up the rules for right eating:

"Build your daily diet around ..... amounts of the ..... food; then eat ....., so long as what you eat is ..... and ....., and the foods selected are ..... and ....., and are ....." *Answer on page* 14.

2. Which of the following would you classify among the so-called basic foods?

	Yes	*No*		*Yes*	*No*
Oranges	....	....	Milk	....	....
Sugar	....	....	Cucumbers	....	....
Gelatin	....	....	Liver	....	....
Kale	....	....	Peanuts	....	....
Mushrooms	....	....	Spices	....	....
Eggs	....	....	Enriched bread	....	....
Corn sirup	....	....	Potatoes	....	....

Answers on page 23, *also pages* 232 *and* 241.

3. Are the following statements true or false?

Amino acids are dangerous acids causing acidosis. ..... *See page* 35.

Fats contain nothing of value to the diet and merely make you fat. ..... *See page* 17.

A caloric is the unit of measurement of the fuel or food-energy value of foods. ..... *See page* 26.

4. In order to be properly nourished the body must be supplied regularly with at least 34 different nutrients.

How many of them can you name or list? *Answer on page* 17.

5. Which of these four food factors is the most important? *See page* 19.

a. Food-energy
b. Protein
c. Vitamins
d. Minerals

6. Are the following foods predominantly a) starchy, b) fat, or c) protein? Check each.

	Starchy	*Fat*	*Protein*
Butter	.....	.....	.....
Lean beef	.....	.....	.....
Spaghetti	.....	.....	.....
Milk, whole	.....	.....	.....
Margarine	.....	.....	.....
Cod fish	.....	.....	.....
Walnuts	.....	.....	.....
Eggs	.....	.....	.....

Answers on page 20, *also page* 274.

7. Approximately how many calories a day are required by a moderately active man of average weight? 1,500 ....., 2,000 ....., 3,000 ....., 4,000 ....., 6,000. ..... *See page* 29.

8. Is it true or false that:

a. Women usually need more calories than men? ....

b. Children of twelve years or more generally require fewer calories than adults? .....

c. Nursing women need more calories than other women? .....

Answers on page 29.

9. An enriched white bread has 8.5 per cent protein, 2.0 per cent fat, 52.3 per cent carbohydrate, and 36.0 per cent moisture. How many calories would be furnished by a slice of this bread weighing 25 grams? *See page* 32.

10. Which of the following foods contain "complete" proteins?

	Yes	*No*		*Yes*	*No*
Spinach	....	....	Corn meal	....	....
Lean pork	....	....	Cheese	....	....
Gelatin	....	....	Eggs	....	....
Lemons	....	....	Eggplant	....	....
Soybeans	....	....			

Answers on page 36.

11. At what ages and under what conditions are the protein needs of the body the greatest? *See page* 37.

12. Alcohol, weight for weight, gives fewer ....., the same ....., more ..... calories than a carbohydrate such as sugar? *See page* 34.

CHAPTER 4

Vitamins for Vigor and Vitality

A FEW YEARS after the Spaniard, Ponce de Leon, came to Florida a French explorer, Jacques Cartier, sailed to Newfoundland. In 1534 he cruised along this northern coast, making friends with Indians in the region which is now Quebec. Two years later he returned, discovering a great river, which was named the St. Lawrence. The Indians told him that he was in the kingdom of Canada, the Huron-Iroquois word for village.

On this second voyage in 1536, Cartier lost twenty-five of his crew from scurvy, a disease which was rife on all of the sailing ships of those times. While wintering near an Indian village in Quebec he noticed that one of the Indians who had been seriously afflicted with this malady ten or twelve days earlier was now recovered. When asked how he had healed himself the Indian explained that he had made a decoction from the leaves and bark of a certain tree. Cartier obtained some of this material, fed it to his ailing crew, and in six days found them restored to health.

Jacques Cartier did not know it, but he had been giving his sick men ascorbic acid, or vitamin C, the anti-scorbutic substance. We do not know precisely what tree provided it in this historic instance although some authorities believe that it may have been the American spruce, or possibly the sassafras.

Despite this experience scurvy continued to wreak havoc on land and sea. From 1556 to 1877 there

were recorded about 150 disastrous epidemics of scurvy on land alone, and ships sailing on long voyages were never free of this serious ailment. Then in 1771 Captain James Cook, the celebrated English navigator, returned to England after a voyage of nearly three years, with the report that he had conquered scurvy. He had insisted that his sailors eat fresh foods, suck lemons, and eat sauerkraut. In the South Seas he made them consume coconuts and native greens and grasses. He repeated this experience on a second voyage lasting three years and sixteen days, and did not lose a man from scurvy.

Although this demonstration should have been convincing, another twenty years or so elapsed before the British navy decided to make fresh fruits and fruit juices an official part of the naval ration. That is why the British sailors are called "limeys," because they were required to consume lime juice. Today we know that lime juice, while valuable, is not as rich an antiscorbutic as orange juice or lemon juice.

The Vitamins are Discovered

From the time of Captain Cook scurvy was recognized as a disease due to a dietary deficiency, but nearly two centuries went by before the first vitamin was discovered. This fortunate event took place in 1913, but in the meantime there were some interesting clues to the existence of these so-called accessory food factors.

As early as 1884, for example, a Swiss investigator, Dr. N. Lunin, fed the known components of milk to laboratory animals, but the animals failed to survive on this artificial mixture. Lunin concluded, therefore, that milk must contain some ingredients in very small quantities which are essential to life.

In 1890 a Dutch physician, Dr. Christiaan Eijkman,

was working in his laboratory in Java in the East Indies. He was using chickens for his experiments, but his results were going all awry. Sometimes the birds got sick and died of a paralysis which resembled the disease known as beriberi in man, sometimes they recovered. Then he discovered the reason.

The doctor had been giving his native boy money to buy rice to feed the chickens. The boy kept the money and begged rice from the hospital steward, who gave him the polished rice that was fed to the patients in the hospital. On this fare the fowl did not do well at all. Then the steward went away, and the boy had to buy rice for his feathered charges. He bought the cheapest he could get, the unpolished brown rice eaten only by the poor. On this natural product the chickens thrived. The outer layers of natural rice contained a substance which could prevent beriberi.

Dr. Eijkman did not report these facts until 1897, and then few other scientists noticed this paper in Dutch. It did, however, attract the attention of a Polish biochemist, Dr. Casimir Funk, who had been working in Germany and England. In 1911 he succeeded in preparing some crystals from rice polishings which cured beriberi. It was he who suggested that this substance be called a "vitamine," for, he said, it is vital and it is an amine. Later, in 1920, after several vitamins had been discovered, the final "e" was dropped from the name.

From Java the nutritional drama shifts to England and then to America. In 1906 an English investigator, Dr. F. Gowland Hopkins, found from feeding experiments on rats that they could not survive when fed purified mixtures of fats, carbohydrates, proteins, and minerals, but that these jaded animals were infused with new life and vigor when small amounts of milk were added to the purified substances. This something

apart from the other constituents of the diet, which had hitherto been thought to be all that were needed in nutrition, was called by Dr. Hopkins an "accessory food factor." Today we know that such factors are vitamins.

Like Dr. Eijkman, Hopkins did not publish the final results of his experiments until half a dozen years later. When his report came out in 1912 the stage was all set for the real discovery of these mysterious substances, the vitamins. The world did not have long to wait.

In the following year it was the Americans who came forward, and with something you could sink your teeth into. From the laboratories of the University of Wisconsin Professor E. V. McCollum and Miss Marguerite Davis reported that there was a specific growth factor in butterfat. Almost simultaneously Drs. T. B. Osborne and L. B. Mendel at Yale University reported their independent discovery of something in butterfat which stimulated growth. This substance was first called "fat-soluble A." It is now known as vitamin A.

A was soon followed by B. In 1915 these same two laboratories reported that there was another growth factor, this time one that was soluble in water instead of fat, and that it could be found in the materials left over after milk sugar had been purified. This factor was known as "water-soluble B." It seemed to be the same as Doctor Funk's antiberiberi "vitamine."

In the course of time it turned out that this B vitamin was not one but at least two different factors, and finally it was discovered that it was a whole series of vitamins. For a while there was considerable confusion, but eventually this was cleared up. After 1921 the term "vitamins" was generally accepted, with letters of the alphabet to designate the different ones that were then known, such as A, B_1, B_2, C, D, and E.

Since 1913 some twenty different vitamins have been

discovered, identified, and catalogued. We now know that they do not comprise a single family, but that each is different. Instead of letters they have been given characteristic names, and many have been made artificially in the laboratory. We know, too, what foods contain them and in what amounts.

Vitamins, then, are exceedingly small, or minute, substances found in natural foods. Without them, human life can not exist. If, furthermore, the body is deprived of certain vitamins disease always results, and sometimes these deficiency diseases are fatal.

Although more than twenty vitamins are now known, and all of them undoubtedly play a role in human nutrition, the precise functions of some of them have not yet been fully determined. For all practical purposes there are half a dozen of these food factors that may be called the "working" vitamins. They are essential in the diet, they must be provided by appropriate foods, and if they are present the others are also likely to be supported.

Let us, then, look first at the six working vitamins, and then consider the others.

Vitamin A

Vitamin A was discovered as the result of experiments which revealed that young animals would grow satisfactorily when furnished butterfat, egg yolk, or cod-liver oil, but would cease to grow when deprived of these foods and given lard instead. Vitamin A is, therefore, of great significance to proper growth and development.

The promotion of growth is, however, only one of the many functions of this important vitamin. It also aids in reproduction and lactation. As early as 1911 Professor S. M. Babcock of the University of Wisconsin

initiated an experiment with cattle which showed that corn-fed animals were superior to wheat-fed and to those on mixtures of the two foods, in their ability to reproduce and raise their young. In this work the professor had the assistance of a number of young men who later became outstanding authorities in the field of nutrition. They were Professors E. B. Hart, G. C. Humphrey, Harry Steenbock, and E. V. McCollum.

Many subsequent tests have confirmed this early work and have shown that vitamin A is the factor involved, and that it applies to humans as well as to animals.

If a person is deprived of vitamin A the first sign of this deficiency occurs in the eyes. The individual is unable to see in a dim light, in other words, suffers from night-blindness, or nyctalopia. If the lack of the vitamin continues the eyeball becomes dry, the lids congested, and the conjunctiva, or membrane of the eye, is inflamed. This disease is known as xerophthalmia. During the years of World War I (1914-1918), children of the poor often suffered from this malady in European countries where the diets were low in vitamin A. As soon as the vitamin was restored to their diets in the form of butterfat, they recovered.

Vitamin A is, therefore, essential to keenness of vision. It will not cure or relieve nearsightedness, farsightedness, or astigmatism, but it will prevent night-blindness and promote sharpness of vision. This it does by feeding a substance known as the visual purple in the retina of the eye, which is bleached out by light and must be constantly replaced.

Promotion of growth, reproduction, lactation, and vision are not the only functions of this versatile vitamin. It is necessary to a healthful condition in the respiratory tract, the nose, mouth, and throat, and also in the alimentary canal and in the urinary tract. It keeps the cells of these parts in healthy condition so that

they are better able to resist infections. There is some evidence that plenty of vitamin A in the diet will help to prevent the development of kidney stones.

A person who partakes of sufficient vitamin A may be protected to some extent against colds, although no substance or food is a positive protection against this disabling disease. The well-fed individual does, however, have better chances of escaping the infection, or at least of having a milder and shorter bout of the disease if it occurs.

Finally, vitamin A is beneficial to the skin. In cases of its deficiency the skin becomes dry and rough, with a pimply eruption at the sites of the hair follicles. This is due to a plugging of the sebaceous glands, which is promptly relieved when the vitamin is restored.

As part of these beneficial influences is the effect of vitamin A upon the teeth. It helps to form the enamel, and it likewise aids in keeping healthy the soft tissues in which the teeth are imbedded. Other vitamins, such as vitamins C (ascorbic acid) and D (calciferol), are also factors in the production of good teeth, as will be explained more fully in a subsequent chapter.

Sources of Vitamin A

Vitamin A was first found in animal fats, such as butter, egg yolk, and cod-liver oil. The animals get it, in turn, from green plants. It was soon discovered, therefore, that the green leaves of our edible plants are rich sources of the vitamin. Here, however, it is not actually the vitamin itself which is present, but a forerunner or precursor of it, known as carotene. When carotene is taken into the body it is converted into vitamin A.

This carotene is a pigment which gives the yellow color to certain vegetables and fruits, such as carrots,

sweet potatoes, squash, and pumpkins. You can, therefore, associate yellow and green colors in vegetables and fruits with an abundance of vitamin A, although there are a few exceptions to this rule.

The outstanding sources of vitamin A in the diet, then, are greens, carrots, liver, squash, sweet potato, cod-liver oil and other fish-liver oils, apricots, dried peaches, butter, fortified margarines, egg yolk, cream, milk, and cheese, especially the cream cheeses.

Some other foods, such as tomatoes, peas, prunes, bananas, etc., also contain vitamin A. Meats, except the glandular organs such as liver, do not have much, and the cereals have very little. Mature seeds have only negligible amounts, and sugars are devoid of this vitamin.

How much do we need? The daily supply in the diet should be liberal. If any excess above immediate needs is taken, it is stored in the liver, where the vitamin can be drawn upon as necessary.

The amount of vitamin A in foods is measured by a unit known as the International Unit, or I.U., which is equivalent to a certain amount of a standard carotene (0.6 microgram). The U.S.P., or United States Pharmacopeia unit is the same as the international, but is also standardized against a reference cod-liver oil, which is kept at the U. S. Pharmacopeia office in Philadelphia.

Adult men and women require daily about 5,000 International Units of vitamin A. During pregnancy and lactation the amount increases for women, rising to about 8,000 units in the latter condition. Up to the age of twelve children do not need as much vitamin A as adults, but after that age they require the full 5,000 units. Under one year the infant should have not less than 1,500, with gradual increases to 4,500 at the age of twelve. As previously explained, these figures are the minima for the day; more does

no harm, and often may be advantageous.

The normal consumer could get nearly half of his day's requirements for vitamin A by eating one egg (425 I.U.), a pint of whole milk (940 I.U.), the usual serving of butter or fortified margarine on his bread or vegetables (280 I.U. per tablespoonful), and by the use of cream in coffee or on cereals (64 I.U. to ¼ cup). He could easily obtain the remainder from a substantial green salad, a piece of liver, a good yellow vegetable, some dried fruits, or from various other foods. A child who is getting cod-liver oil is certain to have enough vitamin A since one teaspoonful alone yields about 3,100 I.U.

Thiamine

Aside from its ability to prevent and cure beriberi, the vitamin known as thiamine, or vitamin B_1, performs many other important functions in the body. Like vitamin A, thiamine contributes to good growth, although in a somewhat different manner. This vitamin also helps to promote reproduction and lactation.

Thiamine aids growth by the maintenance of your appetite and also by its beneficial effects upon your digestion. Many investigations have demonstrated that the addition of thiamine to the diets of children who are thin, pale, restless, and suffering from lack of appetite will convert them into hungry youngsters who gain and thrive. In such instances the vitamin is often given in the form of dried brewer's yeast, a particularly rich source of it.

In the digestive system thiamine acts to promote the tone and activity of the stomach and intestines. It prevents sluggishness and aids in proper elimination. While children need plenty of thiamine for healthful growth (along with vitamin A), adults need it for a

healthy alimentary tract. But that is not all that thiamine does for you.

Another function of this vitamin is to help the body utilize energy from foods. It likewise aids in the prevention of certain nervous disorders which are characteristic of the encroachment, or gradual stealing up of beriberi or beriberi-like symptoms. For this reason thiamine has sometimes been called the "morale" vitamin. How it works in this connection is described more fully in a later chapter, on nutrition and nerves.

Sources of Thiamine

The best food sources of thiamine, or vitamin B_1, are dried brewer's yeast and pork and pork products. Other foods rich in this vitamin include liver and kidney, whole wheat bread and enriched white bread, whole grain cereals and enriched cereals, bran, dried beans and peas, soybeans, peanuts, lamb, milk, oatmeal, potatoes, collards and kale, beef and veal, eggs, poultry and fish. Fruits as a rule are low in the vitamin, although they contain some of it. Green vegetables have fair amounts.

Unlike vitamin A which is quite stable under the usual cooking conditions, thiamine is affected by heat and also by the addition of chemicals such as baking soda to the water in which foods are prepared. The vitamin is soluble in water, and so may be partially dissolved out in the cooking water and lost if this water is discarded or thrown away. In toasting bread there may be a loss of 10 to 20 per cent or more of vitamin B_1, and similar losses may occur in the cooking of cereals or the broiling of meats. Drying of vegetables and fruits does not seem to cause any appreciable loss of this vitamin, and freezing does not affect it to any degree.

The human requirement for thiamine is usually given in terms of milligrams (each about 1/30,000 of an ounce). Thus, a sedentary man needs 1.2 mg. of thiamine a day, a moderately active man 1.5 mg., and a very active man 2.0 mg. Women require somewhat less than men, except during pregnancy and lactation, when 1.8 mg. and 2.0 mg., respectively, are desirable. Children under twelve begin with a requirement of 0.4 mg. under one year and gradually increase until after the age of twelve they should be getting about the adult amount.

As in the case of vitamin A, these are the minimum figures, and more does no harm, but may do good. The American dietary before the adoption of bread enrichment, which includes the addition of thiamine to the loaf, was often likely to be deficient in this important vitamin.

Riboflavin

Although vitamin B was discovered and identified between 1911 and 1915, it was not until 1928 that scientists established beyond doubt that this food factor was at least twins. In milk, for example, are two pigments which give it a yellowish colour. One is carotene, the precursor of vitamin A, and the other is a substance known as a flavin. Both actually are vitamins, and the latter originally was called lactoflavin. It has the interesting property of being fluorescent and of shining brightly when exposed to certain types of light such as black light. You can, in fact, read by the light of this vitamin. At first this lactoflavin, which also occurs in eggs as ovoflavin and in liver as hepatoflavin, was known as vitamin G. Today it is universally called riboflavin, or vitamin B_2. It differs from thiamine in that it will not cure beriberi, but

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it resembles thiamine in that it promotes growth. Riboflavin is also essential to general good health, physical efficiency and vigor, and resistance to disease.

If there is a deficiency of riboflavin, or vitamin B_2, in the diet, a disease known as ariboflavinosis is the result, manifested at first by cracks in the corners of the mouth (cheilosis), a sore mouth with a purplish-red colour of the tongue, and skin troubles. Deficiency in this vitamin likewise affects the eyes, although in a manner different from the night blindness due to lack of vitamin A. There is a watering, itching, and burning of the eyes, with swelling and soreness and dimness of vision, all of which are relieved when riboflavin is restored in satisfactory amounts in the daily diet.

Sources of Riboflavin

Liver, dried brewer's yeast, and milk in any form, whole fluid, canned, or dried, are the richest food sources of riboflavin. Kidney, muscle meats, egg yolk, fish, fresh green vegetables, cheese, and dried beans and peas are all good sources of it. This vitamin is usually associated with thiamine in foods, so that an adequate supply of the one is likely to furnish the other. An exception to this rule is the cereal foods which are poor sources of riboflavin, unless enriched with it.

Unlike thiamine, riboflavin is not so easily destroyed or reduced in cooking. It is, therefore, abundant in those canned foods which are good sources when fresh. This vitamin is, however, rather easily affected by exposure to light such as sunlight. That is one good reason why it is advisable to bring in the bottled milk from the back porch promptly after it has been delivered. That is also the reason why brewer's yeast is generally distributed in dark glass bottles.

As in the case of thiamine, the daily requirement

for riboflavin is measured in milligrams. The sedentary man needs 1.6 mg. a day, the moderately active man 2.0 mg., and the very active man 2.6. Women can get along on a little less, except in the cases of pregnancy and lactation (2.5 and 3.0 mgs., respectively). The requirements for children at various ages parallel those of thiamine, but are a little higher, gradually rising to the age of twelve.

Niacin

The third member of the B group of vitamins to be discovered was the one now known as niacin. It was identified in 1937 by Professor C. A. Elvejhem at the University of Wisconsin, although many clues to its existence had been produced by other investigators. In 1915, for instance, Dr. Joseph Goldberger of the United States Public Health Service conducted a famous experiment at a prison farm in one of our southern states. He put volunteer prisoners on a defective diet which promptly produced in them the disease known as pellagra, a common malady in the South at that time. In 1915 more than ten thousand persons had died of this disease.

From this work Goldberger deduced that pellagra was a dietary deficiency disease, but not until 1926 was he able to announce that it was lack of a vitamin that caused the ailment. This he called vitamin P-P, or the pellagra-preventing substance. Elvejhem showed that it was a well-known chemical, nicotinic acid, which he demonstrated would cure black tongue in dogs, a disease similar to pellagra in man.

Since this nutrient has nothing in common with the nicotine in tobacco, but the similarity in names was confusing to the layman, the name "niacin" was officially adopted for it.

The principal function of this B vitamin, which has no special letter or number, but only a name, is to prevent pellagra in any form, whether mild or severe. The scientific evidence indicates, however, that niacin will not do this most effectively alone, but only when thiamine and riboflavin, and possibly other B vitamins, accompany niacin in the daily diet.

The human requirement for niacin, as measured in the customary milligrams, is about ten times as great as that for thiamine. The best food sources of the vitamin are liver, dried brewer's yeast, pork, bran, salmon, poultry, beef, peanuts, whole grain cereals and enriched cereals and bread, eggs, milk, green leafy vegetables, and potatoes. Corn products are particularly low in this vitamin, or else they contain a substance that is antagonistic to it. Many of the pellagrins in the South in the old days had lived largely on maize and salt pork. When part of a well-balanced diet, corn is of course a good food, but not as an almost exclusive diet.

Ascorbic Acid

Ascorbic acid, or vitamin C, is the food factor which prevents the disease known as scurvy, but that is by no means its only function in human nutrition. This vitamin also helps to build bone, contributes to the strength of the teeth and gums, increases vital resistance against infections, and helps to prevent fragility and rupture in the blood vessels of the body. Scurvy is, in fact, a manifestation of breakdown in some of these functions.

When vitamin C is lacking in the diet the first symptoms are lassitude and weakness, followed by pains in the muscles and joints, which resemble those of rheumatism. As the disease progresses hemorrhages appear in the skin, the legs swell and become tender, and the

gums swell and bleed. Real scurvy is, however, seldom seen in this country, but mild forms of the malady are fairly common. Before World War I scurvy was quite prevalent in infants, but the adoption of the routine use of orange juice and tomato juice in infant feeding has practically eliminated infantile scurvy.

It is interesting to note that in laboratory work on vitamin C the animal employed is the guinea pig, since the white rat and the dog are immune to scurvy and can not be made to develop the disease. Between 1921 and 1931 methods for preparing pure ascorbic acid were worked out in various laboratories, including those of Dr. S. S. Zilva at the Lister Institute in London and of Professor C. G. King at the University of Pittsburgh, so that today this vitamin is available in concentrated form at reasonable prices. The name "ascorbic acid" was officially adopted in 1933.

Plants produce vitamin C as they grow. The best food sources of it, therefore, are the green leaves of edible plants and the citrus fruits, such as oranges, lemons, grapefruit, and limes. Most fruits are, however, good sources of ascorbic acid, the strawberry being on a par with the orange, and the cantaloupe close behind, with the various other fruits trailing along behind these. The tomato, which is really a fruit, is an excellent source of this vitamin.

Among the vegetables the pod of the green pepper plant and also of the red pepper are outstanding sources of ascorbic acid. Other excellent sources are cabbage, turnips, sweet potatoes, lettuce, and all sort of greens. While the white potato is not rich in this vitamin, it contains enough to be a most valuable source because of the quantities of this vegetable that are eaten. Mashed and whipped potatoes will, however, retain less of the vitamin than baked or boiled potatoes, especially when these are prepared in the skins.

Vitamin C is the most easily destroyed of all the vitamins. It is affected by heat, especially in the presence of air or of chemicals such as copper or baking soda. Thus, cabbage is rich in the vitamin, but loses most or much of it during the cooking processes. Even the necessary pasteurization of milk causes loss of this vitamin, although whole milk is not a very good source of it. Except for liver, the animal foods do not contain much vitamin C. Eggs have none, or only traces of it.

Canned vegetables and fruits are, in general, as good sources of vitamin C as are the so-called "fresh" products purchased in stores. These canned goods may, furthermore, be even better sources of ascorbic acid than some vegetables after they have been submitted to the customary methods of home cooking. No canned food would, as a rule, be equal in nutritive value to vegetables or fruits freshly gathered from a home garden or orchard, and eaten raw or carefully cooked immediately after coming from the soil or tree. The canned fruit juices are not significantly inferior to the fresh, from the standpoint of vitamins, but the dried fruits often suffer considerable loss of vitamin C.

In quantity needed, the vitamin C requirements in the diet is about fifty times as great as that for thiamine. The average man or woman must have from 70 to 75 milligrams of ascorbic acid a day, the requirement rising, as is customary with all nutrients, in the cases of pregnancy and lactation, when 100 and 150 mg. are needed, respectively. Children begin with 30 mg. during the first year and gradually increase. This vitamin is not stored in the body, and so must be replenished daily.

Vitamin D

In 1650 an English physician, Sir Francis Glisson,

wrote a classic treatise on rickets, a disease of the bones with which many infants of that period were afflicted. In the years that followed experience showed that this malady could be relieved by the use of cod-liver oil in the diet, but not until 1921 was the explanation forthcoming.

When vitamin A was discovered in 1913, cod-liver oil was found to be one of the best sources of this nutrient. Butter was known to be another excellent source of vitamin A, but butter, unlike cod-liver oil, would not cure rickets. By 1921 this difference was explained through the work of a number of investigators, and a new vitamin, named D, joined the list of the accessory food factors. It was also called the antirachitic vitamin. In modern terminology it is sometimes known as calciferol.

Nature was stingy in putting vitamin D in our common foods. Apparently she intended that we obtain our necessary supply of this factor from the action of sunlight on the human skin. In our skin are substances known as sterols which are activated by the ultra-violet rays of the sun, and converted into vitamin D. Today we know, too, that there are several forms of vitamin D, but that they have approximately the same effect.

These vitamins of the D group (D_2 and D_3) not only prevent rickets in growing children, but they help to build bones and teeth, acting to bring about proper deposits of the minerals, calcium and phosphorus in our skeletal structure.

Aside from cod-liver oil and the other fish-liver oils, such as the tuna, swordfish, halibut, and shark and in canned salmon, vitamin D occurs only in eggs and milk, and in very limited amounts in these foods. The vitamin can, however, be added to certain foods, such as milk, either by irradiating them with ultraviolet light, or by the direct addition of the pure vitamin itself.

All growing children and all pregnant and nursing mothers require at least 400 International Units of vitamin D a day, and will benefit from even more. Adults in general probably have little need for this vitamin, although those who seldom have the opportunity of exposure to sunlight, or elderly persons, may profit from small amounts. They can get it from vitamin D milks or from the various fish-liver oils, one teaspoonful of which usually has more than enough for the day's requirements.

Other Vitamins

The six vitamins described above, vitamin A, thiamine, riboflavin, niacin, ascorbic acid, and vitamin D, are the ones that are of the greatest practical importance in human nutrition. If these are supplied in liberal amounts in the daily diet, any others needed are fairly certain to be present in sufficient abundance. The functions of some of the other known vitamins in the human body are not yet wholly understood, but what is known about them will be summarized in the following paragraphs.

Vitamin E. Originally called "X," this vitamin was discovered in 1922 as the result of experiments on rats which showed its importance in promoting fertility in these animals. Whether this vitamin plays any real part in human nutrition is not known today. It is widely distributed in nature, and is particularly copious in wheat germ. The scientific name for this vitamin is alphatocopherol.

There is now no vitamin with the alphabetical designation of "F."

Vitamin K. Skipping the alphabet a bit, we come to a vitamin of some significance. Discovered in 1934 by a Danish scientist named Dam, it was named "K" after the Danish word "koagulation," since this factor

promotes proper clotting of the blood. When used as a drug, it is valuable in preventing hemorrhages in newborn babies. This vitamin is also widely distributed in natural foods, such as green leafy vegetables, tomatoes, eggs, soybeans, and liver. It may likewise be formed by the body itself in the intestines. The scientific name is menadione.

Folic Acid. Here is a vitamin of considerable significance. It is one of the B group, and received its name because it is associated with foliage, the green leaves of plants. The remarkable thing about this vitamin is that it is a cure, or treatment, for pernicious anemia, at least in certain stages of this serious malady. The best food sources of it are the deep green leaves, such as those of spinach, peas, snap beans, and asparagus. Other good sources are liver, kidney, cauliflower, dry breakfast cereals prepared from wheat, and beef and veal. The vitamin is rather easily destroyed in the canning processes, but is well preserved in the storage of the fresh vegetable. In case anyone wants to know it, the scientific designation for this vitamin is pteroylglutamic acid. The pure extract is used as a medicine and drug.

Pyridoxine. This vitamin, first known as B_6, prevents skin diseases in rats. It has been employed with some success in treating certain types of nervous troubles in humans, but its real function is not known. Foods containing it include liver, yeast, bran, rice, milk, cereals, legumes, meats, and fresh vegetables.

Pantothenic Acid. Another part of the B complex, this vitamin promotes growth and good skin and hair conditions in our laboratory friends, the white rats, but not much is known about its significance to man. Liver contains an abundance of it, while other sources are yeast, eggs, peanuts, meats, cereals, and milk.

At one time this vitamin, along with one or two other

members of the B group, was highly touted as a preventive of the graying of the hair of the human head. Experience showed, however, that the expected results did not materialize, to any appreciable extent. The next vitamin in our list is another which was thought to have this beneficent property.

Para-aminobenzoic acid. This substance acts like a vitamin when fed to laboratory animals. It will keep their hair dark, but not enough evidence has been adduced to justify this claim in the case of humans.

Still Other Vitamins. Among other substances classed as vitamins are: biotin, which prevents injury from the avidin in egg whites; choline, associated with lecithin, a fat-like material in eggs, vegetables, meats, and cereals; inositol, one of the B group, which occurs abundantly in grains, yeast, and meat organs; vitamin M, found in yeast; vitamin P, or citrin, found in paprika and lemon rind, and thought to protect against the permeability, or opening up, of the capillaries, the tiny branches of the arteries. Other substances which may be vitamins have also been located in grass, and in milk, but at the time of writing had not been fully identified.

Further investigations will undoubtedly reveal the true functions of these vaguely known vitamins, and of others as yet undiscovered. In the meantime, the ordinary consumer can forget about them, placing his reliance for adequate nutrition upon the six "working" vitamins, along with other necessary nutrients, such as the complete proteins, the minerals, and sources of sufficient, but not too much, food-energy.

QUESTIONS

1. If any one vitamin is completely lacking in the diet the result is a deficiency disease. Match the particular vitamin with the particular disease in the following list.

Vitamin A	.....	1. Rickets
Thiamine, or B_1	.....	2. Anemia
Riboflavin, or B_2	.....	3. Night blindness
Niacin	.....	4. Beriberi
Ascorbic acid, or C	.....	5. Scurvy
Vitamin D	.....	6. Pellagra
Folic acid	.....	7. Ariboflavinosis

Answers in the text.

2. Approximately how many vitamins are known, 6 ....., 10 ....., 20 ....., 32 .....? *See page* 44.

3. Can you list the six so-called "working" vitamins which are essential in your daily diet, and give the principal functions of each?

a. ....
b. ....
c. ....
d. ....
e. ....
f. ....

Answers on pages 45 *to* 57.

4. Are the following statements true or false?

a. Vitamin E is essential to the prevention of sterility in human beings. ..... *See page* 58.

b. Pregnant women need only the same amount of thiamine, ascorbic acid, and riboflavin as active men. ..... *See page* 51.

c. Vitamin D is necessary in the daily diets of all working men. ..... *See page* 58.

d. Gray hair can be absolutely prevented by proper use of certain vitamins. ..... *See page* 60.

5. Which vitamin aids in the utilization of energy in foods? Vitamin A ....., vitamin K ....., thiamine ....., choline ..... *See page* 50.

6. You require from 70 to 75 milligrams of a certain vitamin every day, because it is not stored in the body. Is it biotin ....., niacin ....., ascorbic acid ....., or vitamin A .....? *See page* 56.

7. What vitamin is stored in the body, and where? *See page* 48.

8. Which vitamins are popularly known as:

a. The "morale" vitamin .....?
b. The "sunshine" vitamin .....?
c. The "antiscorbutic" vitamin .....?
d. The "antirachitic" vitamin .....?

Answers in the text.

CHAPTER 5

A Guide to Good Digestion

THE FOODS WE EAT may be the most nourishing in the world, but they can do us no good until they have been properly digested. Difficulties and disorders in our digestive tracts may in fact, interfere with the proper absorption, assimilation, and utilization of the valuable nutrients in foods. Such digestive difficulties are, furthermore, more common than uncommon in many persons.

Also common are numerous peculiar ideas about the effects of foods on the system. Many people seem to think that a certain food will immediately "dry up the blood," or heat this vital fluid; they often suffer the delusion that a food will "shrink the stomach," or will "line the intestines." Another common fallacy is that certain foods will pass directly and immediately into the milk of a nursing mother and cause trouble in the suckling infant.

In order to clear up these, and many other misconceptions, and to provide facts that may aid in the maintenance of intestinal health and hygiene, let us take a literary trip through the alimentary canal. It is an interesting journey, because there is no more thrilling display than the operations and workings of that most marvelous of all machines, the human.

Any excursion through the alimentary canal, without benefit of gun or camera, begins at its entrance, the mouth, and continues down dark passages, the pharynx

and esophagus, into the cavern known as the stomach. Here we pause for side trips to the remarkable laboratory of the body, the liver, and also to the pancreas and gall bladder. Then on through the coiled small intestines into the large intestine, which ends in the rectum. In all, we shall have traveled about thirty feet. In order to see all the workings of the mechanism, nearly a full day will have been required, since the complete digestion of a single food may need that period of time.

Hunger and Appetite

Eating is generally preceded by the sensation known as hunger. This sensation is a little difficult to describe exactly, but it usually consists of a feeling of weakness and restlessness, probably due to messages carried by the nerves from the alimentary tract. More definite are the pangs which occur in the abdomen over the stomach. This tension lasts only a few seconds, goes away, but then comes back. The sensation is appeased by the taking of food.

Appetite differs from hunger in that it is the desire for food. The two usually occur together, but you can have appetite without hunger. The latter is an inherited characteristic, whereas appetite is more or less acquired. It is based on experience, on memory of attractive viands, and upon the liking for foods. Even after hunger has been appeased, you may still have the appetite for attractive victuals.

Thirst differs from both hunger and appetite. It is a much more painful sensation, which if not assuaged becomes worse. The sensation seems to be localized in the back of the throat, where a feeling of dryness prevails when the system is deprived of sufficient water. We can, incidentally, live without food for several weeks, but without water we die in a few days.

In his play *Macbeth* Shakespeare advises us, with his usual good sense, to let "good digestion wait on appetite, and health on both."

How Digestion Begins

When food is taken into the mouth it consists of the fats, carbohydrates, proteins, minerals, vitamins, and water which are the constituents of the various foods. During the processes of digestion most of these substances are converted into others which the body can use. About the only substances which pass directly into the blood unaltered are alcohol and the simple sugar, dextrose, although water is absorbed from the small intestines.

Digestion begins in the mouth. The mere entry of the food stimulates the flow of saliva, a flow which can also be induced by the sight or smell of food. "It made my mouth water," is a common expression which is based on actual fact. In the saliva is a ferment, or enzyme, known as ptyalin which has the ability to digest starch. This enzyme goes to work at once, although its potency varies in different persons and at different times even in the same person.

How well this enzyme, ptyalin, does its preliminary work depends, in part at least, upon the thoroughness with which the food is chewed, or masticated. We were given teeth for the purpose of chewing our food and they should be employed effectively for that purpose. If food is bolted whole, digestion of it is made much more difficult and also much slower. Mastication likewise prepares the constituents of foods other than starch for proper digestion further along in the alimentary canal.

Starch which has been cooked is, furthermore, easier to digest than is raw starch. Despite this fact, raw

vegetables may be eaten with some impunity, especially since they are particularly valuable sources of vitamins in their natural state.

After food has been chewed it is swallowed. It passes through the pharynx, a tube about five inches long at the back of the throat, and goes down the esophagus, or gullet. This straight, nine-inch tube, or duct, shoves the food along by a series of waves which sweep downward. Water flows right down, but solid food must be pushed by means of these peristaltic waves.

At the entrance to the stomach a muscle known as a sphincter relaxes and admits the food into this organ.

Your Stomach

Food reaches the stomach in about one second after it has been swallowed. The stomach itself is a curved pouch which lies somewhat left of center in the abdominal cavity. It is really only a way station for the food, since digestion is not completed there.

The enzyme, ptyalin, which was produced by the saliva accompanies the food into the stomach and continues its work in the upper part of this organ. As the food moves along this pouch, however, the work of the ptyalin is interrupted by the acid of the stomach.

The walls of the stomach consist of four layers. The inside one, the mucous membrane, is soft and thick and is lined with millions of little glands. These pour out the digestive juices, being stimulated to do so by the presence of food. These digestive juices are comprised mainly of the enzyme known as pepsin and of hydrochloric acid. If milk is consumed another enzyme, rennin, appears for the purpose of curdling the milk. The outer layers of the stomach walls consist of smooth muscle, replete with nerves and blood vessels.

Like the esophagus, the stomach is in motion. When

food enters it, rhythmic waves known as peristalsis push the food along toward the lower end. During this process the pepsin, which works best in the presence of acid, goes to work on the proteins in the foods, beginning to split them up into the amino acids, the building blocks of the body. The acid not only helps this process, but disinfects the food to some extent.

Food remains in the stomach from one to six hours, or even longer, depending upon the type and amount of food consumed. The stomach itself expands and contracts according to the quantity of food in it. This organ is seldom entirely empty, except in cases of fasting or starvation. Although it can receive and accommodate a huge meal, such a heavy intake may sometimes put a severe strain upon it.

Fats remain in the stomach longer than proteins and carbohydrates, and the proteins digest somewhat more slowly than the starches and sugars. For this reason fats give a feeling of fullness, in other words have a high satiety value. An ordinary mixed diet will generally leave the stomach in about four hours in a healthy person. The food, now softened and liquefied, goes out through a valve called the pylorus, a Greek word meaning "gatekeeper." It is now ready for further digestion in the small intestine.

Intestinal Digestion

The small intestine, which continues from the stomach, consists of somewhat over twenty feet of tubing, about two inches in diameter at the upper end, and an inch in diameter at the lower. It is all coiled up so as to get into a comparatively small space. The upper part, about ten inches long, is known as the duodenum.

In this upper tube of the intestine the chyme, or liquid mass of food, remains for some time, waiting for more

additions from the stomach. While it waits the liver sends some bile from one side, and the pancreas contributes some juice from the other. These digestive juices contain more ferments, or enzymes.

The bile coming from the liver stops en route in the gall bladder, a pear-shaped sac about four inches long. Here it is concentrated and stored until needed. Sometimes the bile gets too concentrated in the gall bladder, forming stones. If these get into the little tube, or duct, leading to the duodenum, they cause much pain and trouble, and usually must be removed by surgery.

The function of the bile is to aid in the breaking up of the fats in foods, converting them into fine emulsions. The enzymes in the pancreatic juice are more versatile, however, since they also aid in fat digestion and help to split proteins and digest starch. They finish what the ptyalin of the saliva only started and complete what the pepsin began in the stomach. The small intestine itself contributes a number of enzymes to the process, such as erepsin, a ferment which continues the splitting of the proteins, and several others which operate on what is left of the carbohydrates, or upon those sugars, like lactose or milk sugar, and dextrin which have reached the intestines unchanged.

The movements in the small intestine are peculiar. The columns of liquefied food are churned up, an action of a few seconds, followed by a running wave which pushes the food along. Unlike the stomach, which is normally acid, the small intestine is alkaline in character. The vitamins in foods, the minerals, and some of the water are all absorbed into the system directly from this part of the digestive tract, but the products of the proteins, starches, and fats are taken up mostly from the large intestine, which they reach after several hours in the small.

Although the U-shaped large intestine, or colon, is

only about five feet in length, eight hours are required for the passage of the remainder of the food through it. Here the amino acids from the digestion of the proteins and the blood sugar, or glucose, pass into the capillaries of the intestines and are carried away by the circulating blood. They go direct to the liver, the laboratory of the body, which does some more converting of these substances and also stores them for future use. The fat particles go into the lymph vessels first, and then into the blood and end up in the liver after a roundabout journey.

By the time the food, or the products of the food, have reached the colon, a considerable amount of waste has accumulated. This waste, the feces, collects in the colon, and is eliminated from the rectum from time to time. In a normal person defecation, or emptying of the bowels, occurs once or twice a day. Methods to keep the body regular are described in a later chapter.

The Intestinal Flora

The normal intestinal tract of man is literally swarming with bacteria, forming what is known as our intestinal flora. These organisms enter mainly with our food, and promptly multiply tremendously in the digestive system, particularly in the lower intestine. Every time we drink milk, even pasteurized milk, some bacteria come with it, and vastly more enter on a piece of cheese. Meats, vegetables, and fruits contribute their own quotas of various types of micro-organisms.

These billions of bacteria are not necessarily harmful. On the other hand, they may perform useful functions, contributing to the digestive processes and helping to synthesize, or manufacture, certain vitamins in the body, such as vitamin K and some of the B group of vitamins.

In a healthy individual the predominating types of

bacteria, or the intestinal flora, should be beneficial to the system. Such bacteria protect against the effects of the more noxious types, although they may lose out in combat with such a potent organism as the typhoid bacillus or some of the germs that cause food poisoning, if these are permitted to gain entry.

The species of bacteria best adapted to good intestinal hygiene is the *Lactobaccilus acidophilus*. This may be obtained through the use of acidophilus milk, a specially prepared cultured and fermented milk. The growth and maintenance of these bacteria are, furthermore, promoted by the presence in the lower intestine of milk sugar, or lactose, and the carbohydrate known as dextrin. The protein of milk, the casein, is likewise conducive to favorable conditions in the gastro-intestinal tract. Drinking liberal amounts of pure milk, and eating fruits and vegetables tends, therefore, to establish the right kind of intestinal flora.

In the old days much was made of the alleged dangerous and toxic effects of putrefying bacteria in the lower intestines, especially those which were taken in with meat and meat products. Many allusions were made to a vague condition called "intestinal intoxication," and some of the more faddist systems of vegetarianism were based on the alleged dangers of this condition. It is recognized today, however, that these charges and allegations were very much exaggerated, and that most of them had very little scientific basis. The normal person is in no danger of suffering from intestinal intoxication, and it is doubtful if such a condition even exists.

The Digestibility of Foods

Foods vary in the ease and comfort with which they are digested. The coefficient of digestibility, the percentage of the food available to the body, is nevertheless

surprisingly large in the case of all foods. The body utilizes, as a rule, at least 92 per cent of fat, 95 per cent of protein, and 97 per cent of carbohydrate. Animal foods are, in general, somewhat more efficiently utilized than vegetable foods. Mixed diets are, on the whole, better for the digestion than are single foods. Milk, for example, always has a higher coefficient of digestibility when consumed with other foods, such as bread or solid vegetables.

The cooking of foods renders most of them more readily digestible, although there are some exceptions to this rule. Raw cabbage, for instance, is often easier to digest than cooked cabbage. In most foods cooking breaks up or loosens connective fibres, particularly in meats, so that they may be more easily chewed and so that the digestive juices have readier access to the components of the food. Cooking also has a valuable hygienic role, since it destroys bacteria and parasites, if present in the food. Pork, for example, must always be thoroughly cooked to prevent the possibility of the disease known as trichinosis, due to the possible presence of trichina, or small worms.

Although cooking improves most foods, some raw fruits and vegetables are desirable in the daily diet. Raw fruits such as oranges, apples, pears, peaches, bananas, apricots, and berries, and raw vegetables such as carrots, celery, lettuce, cabbage, greens of various kinds, and numerous others are richer, as a rule, in the natural vitamins and minerals than are the same foods when cooked. Not only that, but they provide useful roughage.

A certain amount of roughage is valuable, and sometimes necessary, in most diets. This roughage, or bulk, consists of the fibres in foods, made up of types of carbohydrates known as celluloses and hemicelluloses, which do not dissolve and break up to any extent in the diges-

tive system. They act, in a way, like a broom sweeping through the intestinal tract. Such a scrubbing must, however, be a comparatively mild one, since too much may be irritating to the alimentary canal.

Some of these celluloses are pretty rough in character, while others are comparatively smooth. In the former class is the bran of wheat, almost flinty in its roughness. In the latter category are most of the fruits, yeast, and the vegetables which are not too woody. Many persons can not comfortably consume whole wheat and other entire grains because of their roughage, but some people thrive upon them. Each individual must determine more or less for himself the proper amount of bulk, or roughage, in his own personal diet.

The normal, healthy individual can eat virtually anything in reasonable amounts. Many persons find, however, that certain foods almost invariably cause distress. The explanation may be a personal idiosyncracy, or it may be an allergy, or sensitivity to the protein in the food. Among the foods that most often cause trouble in individuals are onions, milk and ice cream, raw apples, cooked cabbage, chocolate, radishes, raw tomatoes, oranges, cucumbers, eggs, greasy foods, cantaloupe, meat, and strawberries. Other persons, in fact most, consume these foods with impunity and relish.

Food Allergies

When a person is unduly sensitive to a particular food or group of foods, or to some other substance, we say that he is "allergic" to it, or suffers from an allergy. The word comes from the Greek, with the literal meaning of "altered energy," or altered reactivity. It is estimated that fully 10 per cent of our population is afflicted with rather severe allergies, and that another 30 to 40 per cent suffer from such sensitivities in relatively milder forms.

Foods are, of course, by no means the only offenders. Much more trouble is caused by the pollens of certain plants, by dusts, by animals, and by bacteria. Hay fever, due mainly to ragweed but also caused by other plants and substances, is a manifestation of allergy. Asthma is another.

Allergy to a food may be shown by skin troubles, such as hives or eczema, which follows the ingestion of the offending food, or it may be shown by more severe symptoms. These may include tingling in the throat and swelling, fullness in the head, shortness of breath, and swelling in the membranes of the nose. In severe cases there may be pain in the stomach, diarrhea, and vomiting. Headache is a frequent accompaniment of these serious allergies.

The protein in the food is the trouble-maker. Fats and carbohydrates do not cause allergies, as a rule. The protein is a foreign substance which gives the system a shock. In sensitive individuals the most frequent causes of these allergic symptoms are wheat, milk, eggs, cabbage, tomatoes, strawberries, oranges, chocolate, and nuts. Other foods may be at fault in certain individuals. No food is at fault in others.

Sometimes it is rather difficult to know exactly which food causes the trouble. Although an individual may learn from experience, it is usually necessary to conduct extensive tests to determine the precise allergen. This is done by injecting very small amounts of the suspected food into the skin. The physician who does this then watches the reaction, which can be interpreted only by an expert. Another method of finding the exact cause of a food allergy is to put the sufferer on what is known as an elimination diet. He is fed a basic group of foods, to which various others are added gradually until the inevitable reaction occurs.

Can a person overcome an allergy? In many instances

it can be accomplished, although by no means in all. Children who are allergic sometimes outgrow the condition. Adults may be desensitized by taking or receiving injections of very small amounts of the offending food and gradually increasing until normal amounts can be consumed.

In many cases of severe allergies relief can be obtained by the sufferer only by abstaining from the offending food or foods. Such persons obviously must be familiar with the principles of nutrition, so that they can replace the forbidden food with others which furnish the proper nutrients required to nourish the body.

Disorders of Digestion

Next to common colds and other respiratory ailments, digestive disturbances are the most widespread of all maladies in this country. A system as extensive and as intricate as the alimentary canal unfortunately is highly susceptible to abuse, to infections, to poisoning, and to many other troubles. Our modern way of life seems to favor indigestion and dyspepsia.

To begin at the beginning, the esophagus, or tube leading down to the stomach, may be irritated by excessively hot or extremely cold food or drink, or even by food that is bolted without being properly chewed. While all foods and beverages quickly reach body temperature after a few minutes in the stomach, a process which requires some expenditure of energy by the body, foods should not be consumed at extremes of temperature.

Inflammation of the stomach itself, or gastritis, which may be acute or chronic, is a common ailment. This condition may be due to gross errors of diet, such as overeating or the consumption of too much indigestible roughage, or it may be caused by bacterial or mineral

poisons, or by the toxins of an infectious disease. When stomach troubles occur, it is always wise to withhold all food for a day or two. When permitted to rest, the stomach exhibits remarkable recuperative powers.

Ulcers of the stomach, or peptic ulcers, and ulcers of the duodenum, the tube leading from the stomach to the small intestines, are estimated to afflict at least 5 per cent of our population. The precise cause af these painful conditions is not known, but it is observed that they arise most often in nervous, high-strung individuals who go through life in a state of perpetual excitement. Persons with ulcers obtain some relief by eating milk and cream at frequent intervals, and by living on a bland diet in which soft-cooked eggs, cereals, fruit juices, toast, puréed vegetables, and simple desserts are featured. They must avoid tough meats, coarse vegetables, raw fruits, piquant sauces and seasonings, and alcohol. They should, of course, be under a physician's care.

A few persons suffer from too much acid or too little acid in the stomach. This condition is discussed more fully in the next chapter.

Nervous Indigestion

Nervous indigestion is not an imaginary, but a real disease. It occurs in those people who let their nerves get the best of them, who live under an emotional strain, who are, in fact, neurotic. During World War II the G.I.s had a word for this condition when it happened under the stress of battle. They called it " butterflies in the stomach."

The basis of nervous indigestion is usually an anxiety of some sort. Everyone experiences anxiety at times, but some people insist upon working themselves into a state of chronic anxiety, often quite needlessly. They worry

and fret and stew, usually over trifles. They become irritable, depressed, and fatigued. All of these unnecessary psychoneuroses are reflected in the intestinal tract, which happens to be rather susceptible to nervous and emotional influences.

Jitters of this nature can be easily controlled. One way out for the sufferer is to consult a sympathetic physician and lay his case fully before him, explaining in detail what is on his mind, whether it be business worries, domestic difficulties, sex problems, or any kind of social, political, religious, or other troubles. A doctor versed in psychosomatic medicine will be able to help in all such cases.

Another way to control nervous indigestion is to learn to relax and to enjoy leisure. Too many people have the false idea that they have to live at too fast a pace. Some of these people can be benefited by a change of occupation, or a change of scene, by a vacation or association with a new group of companions. The Army and the Navy cured a lot of cases of nervous indigestion during the late war, not through their very capable medical departments, but merely by taking people into these services. On the other hand, conditions in these services sometimes caused gastrointestinal neuroses.

An individual who is properly nourished, one who obtains plenty of thiamine, or vitamin B_1, and plenty of calcium in his daily diet, is unlikely to suffer from nervous indigestion. Other vitamins in addition to thiamine also play a part in keeping the nerves healthy. If, then, you eat wisely, keep calm, and are determined that you will enjoy life, you can avoid this condition.

Appendicitis

Although that useless organ, the vermiform appendix, is actually not a part of the digestive system, it is

attached to it, lying near the junction of the large and small intestines. This organ is about as thick as a lead pencil and may be from three to seven inches in length. When it becomes inflamed, as the result of infection, the disease appendicitis occurs. If promptly recognized and effectively treated at once, this malady is practically never serious. If neglected, it may be, and generally is.

Appendicitis begins with a colicky pain in the pit of the abdominal cavity, below the navel. The pain gets worse and usually becomes localized in the lower right side. It is followed by nausea and vomiting, and often diarrhea. By that time there is some fever, although the fever does not precede the pain.

When such symptoms occur the sufferer should take no food, no laxatives, no medicines, and no drugs. He should send at once for a physician, and he should remain quietly in bed. The pain can be relieved somewhat by applications of ice to the outside of the abdomen. If laxatives or cathartics are taken at this time, they will set the intestines in motion, and may thus cause rupture of the appendix.

The physician will take blood for an immediate test of the white blood cells, which increase greatly in number in this malady. The whole thing may turn out to be merely a severe digestive upset, but if it is acute appendicitis, then the best procedure is to get rid of this unnecessary organ as quickly as possible. The operation is a comparatively simple one, and convalescence is rapid. The chances of any harm following removal of an appendix within twenty-four hours after the first symptoms is less than one in 200. Delay is, however, dangerous.

Food Poisoning

If a person consumes food which has been freshly contaminated with certain types of bacteria, the result

is startling and most unpleasant. Within a few hours there will be nausea, vomiting, abdominal pain and cramps, diarrhea, and prostration. This is nature's way of getting rid of the infection, and sometimes it is violent. In most cases, however, the attack subsides after a rather brief course, perhaps a day or two, and recovery is complete. Such outbreaks often occur in epidemic form following community suppers, or the consumption of contaminated commercial products by large groups of people.

This type of illness was formerly known as "ptomaine" poisoning, because it was thought to be due to chemical products known as ptomaines which resulted from putrefaction. Actually, there is no such thing, and the term is a misnomer. The poisoning is caused by organisms of the paratyphoid group of bacteria, by others known as salmonella, and sometimes by staphylococci and streptococci, which get into foods that can serve as ideal culture media for these germs.

If, for example, a worker in a bakery has a festering sore on his hand the pus in it is full of germs. If he is preparing cream-filled pastries, he may get some of the bacteria into the ingredients. If, then, this custard-like filling is set aside at room temperature, the bacteria will multiply in it and produce toxins. When customers eat eclairs or chocolate cream pies made in this way, they will become violently ill. This example is a true one, for such outbreaks have actually occurred, in one instance with more than 500 cases in a suburban area near New York City. Because of the dangers in such cream-filled pastries, many health departments forbid their production during the hot summer months, although they can be produced safely.

Food poisoning of bacterial origin can be prevented by the employment of healthy workers, by proper sanitation and hygiene, and by adequate refrigeration and

proper storage of the ingredients and the finished products. If cream-filled pastries and similar products are kept cold, bacteria will not grow in them. The same precautions must be taken with ground meats and many other types of foods.

If canned foods are not properly heated during the process of canning, the disease known as botulism may occur when the foods are later opened and consumed. This serious disease is due to the toxin, or poison, produced by a bacillus that grows and develops in the absence of air, what is known as an "anaerobe." The organism, the *Clostridium botulinum*, is harmless in itself, but shut up in a jar or can with a protein food, it elaborates the toxin, which affects the nerves, and unfortunately is often fatal.

Commercially canned foods now seldom, if ever, cause botulism, but home canned foods may do so, if proper precautions are not taken. The organism does not grow well in acid foods, nor in frozen foods. If it develops in others, it causes the formation of gas and a foul odour. Such canned foods should be destroyed by burning or burying, so that animals can not eat them. If there is any question about a home canned food, it should be boiled; if a bad odour occurs, the food should be discarded.

Your Colon

The hygiene of the colon, the end of the alimentary canal, will be discussed more fully in the chapter on Keeping the Body Regular (page 134). This organ is, however, liable to various types of inflammation, or colitis, which must be carefully treated, and for which bland diets are prescribed by the physician. Smooth diets, containing plenty of milk, are generally employed in such cases.

QUESTIONS

1. What is the difference between hunger and appetite? What is thirst? *See page* 64.

2. Where does digestion begin and how? *See page* 65.

3. Why should all foods be thoroughly chewed? *See page* 65.

4. Your stomach is naturally alkaline ....., acid ..... *See page* 66.

5. The average meal remains in the stomach about 1 hour ....., 2 hours ....., 4 hours ....., 6 hours ....., 8 hours ..... *See page* 67.

6. The small intestine is about 6 feet ....., 10 feet ....., 20 feet ....., 30 feet ..... in length? *See page* 67.

7. The bile comes from the spleen ....., the pancreas ....., the liver ....., the kidneys ..... What is its function? *See page* 68.

8. From what part of the alimentary canal are most nutrients absorbed by the body, and how? *See page* 69.

9. How can you promote a favorable intestinal flora? *See page* 70.

10. What can you do to avoid nervous indigestion? *See page* 75.

11. Is it true or false that:

a. Most indigestion is caused by ptomaine poisoning. .....

b. Botulism is common in commercially canned foods. .....

c. You can safely leave custard and cream-filled foods at room temperature during hot weather.

Answers on page 78.

CHAPTER 6

The Truth About Acidosis

MANY PEOPLE are often heard to assert and complain that they are suffering from "acidosis," or an "acid condition," or "too much acid," or an "acid stomach." Such deluded individuals generally dash about striving to find strictly non-acid foods, or they may partake of a peculiar combination of foods which some charlatan or food faddist has alleged would cure this terrible condition.

Now, real acidosis is so rare as to be almost a myth. It is, in fact, actually a myth in the normal, average person. True, the condition can occur, but it happens at the rate of about once in ten million persons, and then only as a result of a severe malady.

Occasionally, acidosis or something like it may be a symptom in serious diabetes. It may occur as a result of prolonged starvation, or because of severe and persistent vomiting and diarrhea in infants and sometimes in adults. It may arise in one or two other dangerous ailments, but this condition is virtually never present in the normal eater, no matter what he eats. Let me explain.

Your Alkaline Blood

The myth of acidosis or a so-called acid condition probably arose because human blood is mildly alkaline. This natural alkalinity of the blood can not, however, be appreciably changed by any ordinary use or combination of foods. The human machine takes care of that itself. In this remarkable mechanism are various effect-

ive defenses against alterations in its customary chemical qualities, defenses which only certain dangerous diseases can break down.

First and foremost of these natural defense mechanisms of the body is what is known as the "buffer" action of the blood itself. In the blood stream are chemical substances, alkaline phosphates and bicarbonates, chlorides, and hemoglobin, which react with the carbonic acid of the blood to keep it in a constant state of chemical equilibrium. You can not get rid of these buffers if you try.

This delicate balance is further aided by the lungs as they dispose of the waste product, carbon dioxide, one of the end products resulting from the combustion of foods in oxygen. The others are water and free energy. The lung is, therefore, the second line of defense in maintaining the acid-base balance of the human body.

The third is the kidney, or rather the pair of these organs. Unlike the blood, the urine excreted by the kidneys may show a rather wide range of either acidity or alkalinity. The kidneys are laboratories which receive the blood and remove from it various waste products, including what is left of the protein foods, salts, and excess water. After this filtering and converting process, the kidneys return the blood to the system.

The acidity or alkalinity of foods is, in fact, measured by their effects on the kidneys, which deftly eliminate excess acid or alkalies. The process may be interrupted or interfered with by kidney disease, but under ordinary conditions it is a most effective one.

Chemical Reactions of Foods

All foods produce definite chemical reactions in the body, although what kind depends, of course, upon the composition of the food. Most leave an alkaline re-

action, but some are acid, and a few are neutral. These are interesting facts, but not especially significant ones. As previously explained, all foods undergo various intricate processes in the body before they are utilized by it. Some are acid when they are consumed, but end up by being alkaline.

Among the foods giving an acid reaction, as shown in the urine, are meats, fish, shellfish, and eggs. The most acid of all foods is, in fact, the oyster, but it is a good food despite this fact. Bread made with water is mildly acid, but when made with milk solids it is more or less neutral, since milk is alkaline. The cereals such as wheat, rice, oatmeal, and corn are acid.

Although fruits are naturally acid, due to the presence of citric acid, malic acid, and other organic acids, these substances are oxidized and converted in the body, so that the end result is an alkaline reaction. The only fruits leaving an acid residue are plums, prunes, and cranberries, which contain quinic acid. Instead of being completely oxidized in the body, this acid is changed into hippuric acid, which appears as such in the urine. The fruit which is potentially the most alkaline of all is the olive, but tomatoes, apples, pears, oranges, lemons, apricots, peaches, and pineapples all diminish the acidity of the urine. As a matter of fact, usually less than 5 per cent of any citric acid compound appears in our excretions.

Other base-forming foods include practically all the vegetables. Milk and cream display a mild alkalinity, although they contain lactic acid. Among the neutral foods, which have neither an acid nor an alkaline reaction, are the pure fats, sugars, and starches, and any other foods which are devoid of minerals.

In the ordinary mixed diet, the usual fare of the sensible person who has not succumbed to the wiles and false premises of the food fakir, the acid and base-

forming elements will usually be well-balanced. Even if there is a slight preponderance of one or the other, no harm can result.

Scientific experiments have shown that the consumption of a whole quart of milk, or a quart of orange juice, or a pound of bananas, all alkali-forming foods, will not produce even a temporary shift in the chemical composition of your blood, at least in normal persons. A pound of beefsteak, giving a considerable acid ash, caused no change in the blood of three out of four individuals tested in these experiments, and only a slight and temporary reduction in the alkalinity of the blood in the fourth person.

Numerous investigations such as these indicate that you would have to consume every day an ounce and a half of a pure alkaline substance, such as sodium bicarbonate, or baking soda, to achieve even a tiny increase in the alkalinity of your blood. Conversely, you would have to take about two-thirds of an ounce daily of an edible acid substance, such as ammonium chloride, to reduce the blood alkalinity to any appreciable extent.

Translated into terms of food, this means that to accomplish the same results you would have to consume at one time eighteen pounds of oranges to increase your alkalinity, or eat two and a half pounds of oysters at one sitting, or four and a half pounds of beefsteak, and nothing else, to diminish the blood alkalinity. Even if you could perform such a gastronomical feat, the change in the blood would be only temporary. The body insists upon keeping itself stable and in chemical equilibrium.

Many fruits and vegetables contain an organic substance known as oxalic acid, usually combined in the form of oxalates. Small amounts do no harm whatever, but considerable quantities may interfere with good

nutrition, by preventing the proper absorption of the food-mineral calcium, and also iron. Thus, spinach contains enough oxalic acid to reduce the effectiveness of its iron and calcium. Other foods containing this substance are beet greens, rhubarb leaves, and sorrel.

Often confused with acidosis is another condition known as ketosis. If the daily diet is unduly high in fats and low in carbohydrate foods, such as the sugars and starches, there usually occurs an incomplete combustion of fat in the body. The resulting ketone bodies then accumulate in the blood. This ketosis, or the flooding of the system with certain organic acids, also happens in cases of starvation, and it may sometimes be an unfortunate manifestation in faddist reducing diets, or those which attempt to achieve rapid loss of weight on near-starvation diets. Ketogenic diets have been, however, employed by physicians in the treatment of certain diseases, notably epilepsy.

In sensible reducing, ketosis and acidosis-like conditions are averted if the reducing process is a reasonably gradual one, aimed at a weight loss of about a pound a week. These unpleasant conditions are also avoided when a reasonable amount of carbohydrate is included in the reducing diet. It has long been an axiom among scientists that, "fat burns best in the flame of the carbohydrate."

If, then, you get the weird idea that you are suffering from acidosis or an acid condition of the body, you are generally afflicted not with a physical malady, but with a phobia, a false assumption. No one who is able to walk about ever has a real acidosis in any degree. Those who actually have it usually are flat on their backs in a hospital.

Acid Stomach

Acid stomach is something else again, but even this

term is subject to much misconception. Whenever a person who has just taken sustenance suffers from pains in the abdominal region, accompanied by heartburn and acid eructations, more commonly and less politely known as belchings and burpings, he is often convinced that he is afflicted with "acid stomach." This may, or may not, be nonsense.

Now, there is such a condition as "gastric hyperacidity," due to excess of acid in the gastric juice, but it is seldom caused by injudicious eating, or even by ordinary indigestion. It might be due to nervous and emotional troubles, but it is generally due to physical troubles, such as ulcers or gall bladder disease. Only the physician can tell, after a proper examination.

The burning sensation known as "heartburn," on the other hand, may be caused by any one of a number of things. It is called heartburn, or cardialgia, because the pain seems to be in the region of the heart, although actually it arises in the alimentary canal. This distress may be caused by indigestion, or gastritis, either acute or chronic; by normal pregnancy; by ulcers or other tumors; by expansion of the stomach because of loss of tone; and, finally, by too much acid in the stomach, if that condition really exists. Mild heartburn can often be relieved with antacids such as bicarbonate of soda, taken in small amounts.

As previously explained, the normal stomach is naturally acid, and should be. The precise amount of acid in the stomach of any individual depends upon various factors, such as the amount and kind of food eaten, the state of the emotions, and other influences. The flow of acid into the stomach is stimulated by the entry of food and fluid into this organ, and also by such psychic factors as the mere thought of food. The aroma of savory foods will even start the little glands working. Conversely, the flow of acid can be stopped

altogether by such strong emotions as fear, worry, or great excitement.

Although mild alkalies in reasonable amounts will often relieve minor gastric distress, the habit of continuous taking of soda and other alkaline substances is inadvisable. Rugged use of such remedies does more harm than good, since regular dosing of the body with them stimulates the stomach to pour out more and more acid to neutralize the alkali.

A few persons suffer from the opposite of gastric hyperacidity, that is, they have no acid at all in their stomachs. This condition, known as "achlorhydria," may be inherited or acquired. Sometimes it accompanies pernicious anemia or other organic diseases. Sometimes, too, it does no harm at all, and the individual continues in good health. He may, or may not, have to take properly diluted hydrochloric acid with his meals, to supply the acid that is lacking in his stomach. That, again is for his physician to decide.

These disturbances in the acid content of the stomach are not very common. Chronic sufferers from what they think is "acid stomach" should, however, consult their family physicians, who can make suitable tests to ascertain the true cause of the condition. Self medication in such cases is seldom, if ever, advisable because it is more likely to be wrong, and more than likely, if wrong, to aggravate the condition.

Although the stomach is naturally acid, the intestines are naturally alkaline. Although the blood is naturally alkaline, many of the other tissues of the body are somewhat less alkaline. The skin, for example, is covered with a thin "acid mantle," due in part to the nature of the skin itself, and in part to the secretions from the sweat. People who think they have "acid skin," then, have what they should have, something desirable.

No one should, therefore, be concerned about so-called acidosis, unless he or she happens to be a sufferer from diabetes. In the normal individual the condition just does not exist. Similarly, most persons need not be concerned about so-called "acid stomach." A great deal of bunk has been written about both of these conditions, mainly by food faddists, and it is high time that much of it be debunked.

QUESTIONS

1. Which of the following organs of the body are naturally acid, and which are naturally alkaline?

	Acid	*Alkaline*
Stomach	.....	.....
Intestines	.....	.....
Skin	.....	.....
Blood	.....	.....
Kidneys	.....	.....

Answers on page 87.

2. Which of the following foods give an acid reaction in the body, and which give an alkaline reaction, or a neutral reaction?

	Acid	*Alkaline*	*Neutral*
Bread	.....	.....	.....
Milk	.....	.....	.....
Oysters	.....	.....	.....
Sugar	.....	.....	.....
Grapefruit	.....	.....	.....
Veal	.....	.....	.....
Salad oil	.....	.....	.....
Carrots	.....	.....	.....
Strawberries	.....	.....	.....

Answers on page 83.

3. What is the difference between acidosis and ketosis?
See page 85.

4. Does acidosis ever occur in normal persons who partake of a sensible mixed diet? Yes ....., no .....
See page 85.

CHAPTER 7

The Right Way to Reduce

OBESITY IS, in general, as unnecessary as it is unsightly and uncomfortable. Corpulence is a condition which should never be permitted to occur, because it is a preventable condition. If, however, it has been allowed to happen, then it should be rectified without delay.

The hazards of overweight have been indicated in the first chapter of this book. Obesity definitely tends to shorten life, and to make it less pleasant. It is, in fact, an abnormal condition which not only lessens the attractiveness of the rotund individual, but increases his or her susceptibility to heart troubles, high blood pressure, kidney diseases, diabetes, gout, and various other unpleasant degenerative maladies.

Practically all obesity is nutritional in origin. It is due to indiscretions in eating, to consumption of too much food, particularly of fats and carbohydrates. It is caused by taking too many calories, by taking more than the body can expend for its customary energy needs. This excess is stored in the body as fat, usually in unduly conspicuous places.

The exceptions to this rule are few and far between. It is true that some people eat heartily and often, but do not put on weight; it is equally true that some people eat very little, but grow ponderous despite such a dietary regime. These rare cases may be due to over- or underactivity of one or more of the endocrine glands in the body. It is possible, too, that heredity plays a part in these peculiar conditions. Such infrequent cases may

often be relieved by proper medical treatment, along with appropriate dietary measures.

With these special cases we are not concerned in this book, but we are concerned with the vast majority of the overweight who can achieve desirable slimness if they only have the desire and the will-power to do so. The sensible reducing regime is not arduous, although it may require a little patience, and sometimes a little fortitude. A sylph-like form, with normal body proportions, can be attained by most persons without too much difficulty, provided that they go about it in the right way and not the wrong way. There is only one right way, but many wrong ones.

Your Right Weight

Before embarking upon any reducing regime it is always wise to pause and ask yourself this question, "What is my ideal weight?" A guide to the answer may be obtained by looking up your weight for your height and age in one of the standard weight tables, such as those shown on pages 91-96. If you are 35 years old and ought to weigh 125 pounds, but actually weigh 160, it is obvious that you are considerably overweight, and that reducing is indicated.

These so-called "standard" weight tables are, however, merely the averages of the weights of hundreds of thousands of persons. A deviation from them of 10 per cent, or even more, does not necessarily mean gross overweight or underweight. Individuals vary in stature and physique, some being naturally small-boned, others large-framed. What is ideal weight for one may not be for another, because actually the body is a cylinder and not a rod.

The best person to tell you exactly what is your ideal weight is your family physician. It is, in fact, always desirable to seek his advice before undertaking to reduce.

TABLE I

Average Weight for Height Tables

*For Girls from Birth to School Age**

HGHT. (In.)	1 Mo.	3 Mos.	6 Mos.	9 Mos.	12 Mos.	18 Mos.	24 Mos.	30 Mos.	36 Mos.	48 Mos.	60 Mos.	72 Mos.
20	8											
21	9	10										
22	10	11										
23	11	12	13									
24	12	13	14	14								
25	13	14	15	15								
26		15	16	17	17							
27		16	17	18	18							
28			19	19	19	19						
29			19	20	20	20						
30			21	21	21	21	21					
31				22	22	23	23	23				
32					23	24	24	24	25			
33						25	25	25	26			
34						26	26	26	27			
35						29	29	29	29	29		
36							30	30	30	30	31	
37							31	31	31	31	32	
38								33	33	33	33	
39								34	34	34	34	34
40									35	36	36	36
41										37	37	37
42										39	39	39
43										40	41	41
44											42	42
45												45
46												47
47												50
48												52

*For Boys from Birth to School Age**

HGHT. (In.)	1 Mo.	3 Mos.	6 Mos.	9 Mos.	12 Mos.	18 Mos.	24 Mos.	30 Mos.	36 Mos.	48 Mos.	60 Mos.	72 Mos.
20	8											
21	9	10										
22	10	11										
23	11	12	13									
24	12	13	14									
25	13	14	15	16								
26		15	17	17	18							
27		16	18	18	19							
28			19	19	20	20						
29			20	21	21	21						
30			22	22	22	22	22					
31				23	23	23	23	24				
32				24	24	24	25	25				
33					26	26	26	26	26			
34						27	27	27	27			
35						29	29	29	29	29		
36							30	31	31	31		
37							32	32	32	32	32	
38								33	33	33	34	
39								35	35	35	36	
40									36	36	36	36
41										38	38	38
42										39	39	39
43										41	41	41
44											43	43
45											45	45
46												48
47												50
48												52
49												55

* Prepared by Robert M. Woodbury, Ph.D., Children's Bureau, U. S. Department of Labor.

For Girls from 5-18 Years*

HGHT. (In.)	5 Yrs.	6 Yrs.	7 Yrs.	8 Yrs.	9 Yrs.	10 Yrs.	11 Yrs.	12 Yrs.	13 Yrs.	14 Yrs.	15 Yrs.	16 Yrs.	17 Yrs.	18 Yrs.
38	33	33												
39	34	34												
40	36	36	36											
41	37	37	37											
42	39	39	39											
43	41	41	41	41										
44	42	42	42	42										
45	45	45	45	45	45									
46	47	47	47	48	48									
47	49	50	50	50	50	50								
48		52	52	52	52	53	53							
49		54	54	55	55	56	56							
50		56	56	57	58	59	61	62						
51			59	60	61	61	63	65						
52			63	64	64	64	65	67						
53			66	67	67	68	68	69	71					
54				69	70	70	71	71	73					
55				72	74	74	74	75	77	78				
56					76	78	78	79	81	83				
57					80	82	82	82	84	88	92			
58						84	86	86	88	93	96	101		
59						87	90	90	92	96	100	103	104	
60						91	95	95	97	101	105	108	109	111
61							99	100	101	105	108	112	113	116
62							104	105	106	109	113	115	117	118
63								110	110	112	116	117	119	120
64								114	115	117	119	120	122	123
65								118	120	121	122	123	125	126
66									124	124	125	128	129	130
67									128	130	131	133	133	135
68									131	133	135	136	138	138
69										135	137	138	140	142
70										136	138	140	142	144
71										138	140	142	144	145

For Boys from 5-19 Years*

HGHT. (In.)	5 Yrs.	6 Yrs.	7 Yrs.	8 Yrs.	9 Yrs.	10 Yrs.	11 Yrs.	12 Yrs.	13 Yrs.	14 Yrs.	15 Yrs.	16 Yrs.	17 Yrs.	18 Yrs.	19 Yrs.
38	34	34													
39	35	35													
40	36	36													
41	38	38	38												
42	39	39	39	39											
43	41	41	41	41											
44	44	44	44	44											
45	46	46	46	46	46										
46	47	48	48	48	48										
47	49	50	50	50	50	50									
48		52	53	53	53	53									
49		55	55	55	55	55	55								
50		57	58	58	58	58	58	58							
51			61	61	61	61	61	61							
52			63	64	64	64	64	64	64						
53			66	67	67	67	67	68	68						
54				70	70	70	70	71	71	72					
55				72	72	73	73	74	74	74					
56				75	76	77	77	77	78	78	80				
57					79	80	81	81	82	83	83				
58					83	84	84	85	85	86	87				
59						87	88	89	89	90	90	90			
60						91	92	92	93	94	95	96			
61							95	96	97	99	100	103	106		
62							100	101	102	103	104	107	111	116	
63							105	106	107	108	110	113	118	123	127
64								109	111	113	115	117	121	126	130
65								114	117	118	120	122	127	131	134
66									119	122	125	128	132	136	139
67									124	128	130	134	136	139	142
68										134	134	137	141	143	147
69										137	139	143	146	149	152
70										143	144	145	148	151	155
71										148	150	151	152	154	159
72											153	155	156	158	163
73											157	160	162	164	167
74											160	164	168	[illegible]	[illegible]

TABLE II

Standard Table of Heights and Weights

MEN

Light-face Figures are 20 Per cent Under and Over the Average

HEIGHTS		WEIGHTS ACCORDING TO AGE PERIOD								
Feet	Inches	15 to 19	20 to 24	25 to 29	30 to 34	35 to 39	40 to 44	45 to 49	50 to 54	55 to 59
		89	94	98	100	102	104	106	106	107
4	11	111	117	122	125	127	130	132	133	134
		133	140	146	150	152	156	158	160	161
		90	95	99	102	103	106	107	108	109
5	0	113	119	124	127	129	132	134	135	136
		136	143	149	152	155	158	161	162	163
		92	97	101	103	105	107	109	110	110
	1	115	121	126	129	131	134	136	137	138
		138	145	151	155	157	161	163	164	166
		94	99	102	105	106	109	110	111	112
	2	118	124	128	131	133	136	138	139	140
		142	149	154	157	160	163	166	167	168
		97	102	105	107	109	111	113	114	114
	3	121	127	131	134	136	139	141	142	143
		145	152	157	161	163	167	169	170	172
		99	105	107	110	112	114	115	116	117
	4	124	131	134	137	140	142	144	145	146
		149	157	161	164	168	170	173	174	175
		102	108	110	113	115	117	118	119	120
	5	128	135	138	141	144	146	148	149	150
		154	162	166	169	173	175	178	179	180
		106	111	114	116	118	120	122	122	123
	6	132	139	142	145	148	150	152	153	154
		158	167	170	174	178	180	182	184	185
		109	114	117	119	122	123	125	126	126
	7	136	142	146	149	152	154	156	157	158
		163	170	175	179	182	185	187	188	190
		112	117	120	123	126	127	129	130	130
	8	140	146	150	154	157	159	161	162	163
		168	175	180	185	188	191	193	194	196
		115	120	123	126	130	131	133	134	134
	9	144	150	154	158	162	164	166	167	168
		173	180	185	190	194	197	199	200	202
		118	123	126	130	134	135	137	138	138
	10	148	154	158	163	167	169	171	172	173
		178	185	190	196	200	203	205	206	208
		122	126	130	134	138	140	142	142	143
	11	153	158	163	168	172	175	177	178	179
		184	190	196	202	206	210	212	214	215
		126	130	135	139	142	145	146	147	148
6	0	158	163	169	174	178	181	183	184	185
		190	196	203	209	214	217	220	221	222
		130	134	140	144	147	150	152	153	154
	1	163	168	175	180	184	187	190	191	192
		196	202	210	216	221	224	228	229	230
		134	138	145	149	153	155	158	158	159
	2	168	173	181	186	191	194	197	198	199
		202	208	217	223	229	233	236	238	239
		138	142	150	154	158	161	163	164	165
	3	173	178	187	192	197	201	204	205	206
		208	214	224	230	236	241	245	246	247

TABLE III

Standard Table of Heights and Weights

WOMEN

Light-face Figures are 20 Per cent Under and Over the Average

HEIGHTS		WEIGHTS ACCORDING TO AGE PERIOD								
Feet	Inches	15 to 19	20 to 24	25 to 29	30 to 34	35 to 39	40 to 44	45 to 49	50 to 54	55 to 59
		88	90	93	95	98	101	103	105	106
4	11	110	113	116	119	122	126	129	131	132
		132	136	139	143	146	151	155	157	158
		90	92	94	97	99	102	105	106	107
5	0	112	115	118	121	124	128	131	133	134
		134	138	142	145	149	154	157	160	161
		91	94	96	98	101	104	106	108	110
	1	114	117	120	123	126	130	133	135	137
		137	140	144	148	151	156	160	162	164
		94	96	98	100	103	106	109	110	112
	2	117	120	122	125	129	133	136	138	140
		140	144	146	150	155	160	163	166	168
		96	98	100	102	106	109	111	113	114
	3	120	123	125	128	132	136	139	141	143
		144	148	150	154	158	163	167	169	172
		98	101	103	106	109	111	114	115	117
	4	123	126	129	132	136	139	142	144	146
		148	151	155	158	163	167	170	173	175
		101	103	106	109	112	114	117	118	120
	5	126	129	132	136	140	143	146	148	150
		151	155	158	163	168	172	175	178	180
		104	106	109	112	115	118	121	122	122
	6	130	133	136	140	144	147	151	152	153
		156	160	163	168	173	176	181	182	184
		107	110	112	115	118	121	124	126	126
	7	134	137	140	144	148	151	155	157	158
		161	164	168	173	178	181	186	188	190
		110	113	115	118	122	124	127	130	130
	8	138	141	144	148	152	155	159	162	163
		166	169	173	178	182	186	191	194	196
		113	116	118	122	125	127	130	133	134
	9	141	145	148	152	156	159	163	166	167
		169	174	178	182	187	191	196	199	200
		116	119	122	124	127	130	133	136	138
	10	145	149	152	155	159	162	166	170	173
		174	179	182	186	191	194	199	204	208
		120	122	124	126	130	133	136	139	142
	11	150	153	155	158	162	166	170	174	177
		180	184	186	190	194	199	204	209	212
		124	126	127	130	132	135	138	142	146
6	0	155	157	159	162	165	169	173	177	182
		186	188	191	194	198	203	208	212	218

After a thorough examination he might find conditions which would make reducing dangerous or undesirable. at least until the conditions have been corrected. On the other hand, he may say, "go ahead, it will do you good."

Prior to World War II it was estimated that fully 20 per cent, or one-fifth, of the American people were overweight. This figure may have been lowered a little during the war years, when there was great industrial activity and a somewhat restricted food supply, but it has not been lowered much. Obesity is still one of the

TABLE IV

Ideal Weights for Men, Ages 25 and Over

HEIGHT (with shoes)		WEIGHT IN POUNDS (as ordinarily dressed)		
		Small Frame	Medium Frame	Large Frame
Feet	Inches			
5	2	116-125	124-133	131-142
5	3	119-128	127-136	133-144
5	4	122-132	130-140	137-149
5	5	126-136	134-144	141-153
5	6	129-139	137-147	145-157
5	7	133-143	141-151	149-162
5	8	136-147	145-156	153-166
5	9	140-151	149-160	157-170
5	10	144-155	153-164	161-175
5	11	148-159	157-168	165-180
6	0	152-164	161-173	169-185
6	1	157-169	166-178	174-190
6	2	163-175	171-184	179-196
6	3	168-180	176-189	184-202

Metropolitan Life Insurance Company, Statistical Bureau, 1943.

unfortunate characteristics of too many American citizens. Since the war, in fact, America is the one nation in the world where many fat people are still observed. Most of the rest of the world has been on a real reducing diet for many years.

The average weight of the American woman is, however, better than it used to be. Statistics have revealed the gratifying fact that American women of every age are from three to five pounds lighter than they were a decade or two ago. As a consequence, they are somewhat healthier.

TABLE V

Ideal Weights for Women, Ages 25 and Over

HEIGHT (with shoes)		WEIGHT IN POUNDS (as ordinarily dressed)		
		Small Frame	Medium Frame	Large Frame
Feet	Inches			
4	11	104-111	110-118	117-127
5	0	105-113	112-120	119-129
5	1	107-115	114-122	121-131
5	2	110-118	117-125	124-135
5	3	113-121	120-128	127-138
5	4	116-125	124-132	131-142
5	5	119-128	127-135	133-145
5	6	123-132	130-140	138-150
5	7	126-136	134-144	142-154
5	8	129-139	137-147	145-158
5	9	133-143	141-151	149-162
5	10	136-147	145-155	152-166
5	11	139-150	148-158	155-169

Metropolitan Life Insurance Company, Statistical Bureau, 1943.

Curves, believe it or not, are the gift of Nature to the feminine form. The slightly sinuous, billowy figure is as healthful as it is alluring, because the well-proportioned body is one that is reasonably well-rounded. Charm can seldom be achieved with a shape that is rigidly rod-like in its slenderness. There are, of course, proper limitations to this matter of anatomical curves. They should be lissome and not ponderous, mildly elliptical rather than boldly spherical. In other words, the form should fit the age and physique of the bearer, and conform to the ideal weight of the individual.

How to Reduce

Having decided, or having been advised by your physician, that reducing is necessary, desirable, or allowable, the next step is to select a diet that is sufficiently low in calories but is high in all-around nutritive values. Since obesity is almost always a matter of overconsumption of foods, reducing is achieved by an underconsumption of foods, at least as measured in calories.

As a general rule, the daily reducing diet should not go below approximately 1,200 calories a day. Such a diet should result in the loss of one to two pounds a week, depending upon how much there is to lose. Moderate rates of reduction are more likely to conserve health, prevent wrinkles and flabby skin, and avoid nervous disorders.

More intensive methods of weight reduction are, however, advocated by some reputable physicians, provided that the patient can be more or less continuously supervised by the doctor, and that all essential nutriments are supplied in the reducing diet. Such limited diets may contain only 1,000 calories a day, or even less, with resulting losses of about four pounds a week.

Too rapid and violent methods of reducing, built

around faddist diets, invariably cause bad effects. Often they are merely starvation fare, which may cause acidosis-like conditions and leave the reducer in a weakened physical and mental condition. Similarly, diets which employ only one food for a short time, such as all-banana or an all-meat diet, can not possibly nourish the body effectively. No single food is perfect from the standpoint of human nutrition. During reducing there *must* be adequate nourishment, and that can be obtained only from a proper mixture of wholesome foods.

The way to reduce, then, is to cut down your calories by about 30 to 50 per cent of the number which would be required to maintain your best weight, not your actual weight (if overweight). A simple method of computation of the correct number of calories is first to look up your average or best weight in one of the standard tables. This is what you ought to weigh for your height and age, not what you do weigh. Then multiply this "best" weight by 15 if you are a moderately active person, or by 20 if you are a very active one, and in either case deduct or subtract 500 from the result. The remainder gives the desirable number of calories in your reducing diet.

Here is a specific example of this method. You are a woman of thirty years of age, five feet tall, a moderately active homemaker. The weight table says that you should weigh about 120 pounds, but actually you display 160 on the scales. Multiplying 120 x 15 gives 1,800. Deducting 500 leaves 1,300. That is an appropriate number of calories to bring your weight down gradually. By consulting tables of the calories in foods you can concoct and devise a diet that will have the proper amount of food-energy. But remember, the quality of such a reducing diet is just as important to you as is the quantity.

Foods For Reducing

Contrary to a much too common belief, no single food is fattening. It is the diet as a whole which causes overweight, not any one food. The converse is equally true, no single food will bring about reduction in weight. People sometimes have the erroneous idea that if they consume lemon juice or some other fluid they can eat as much of other foods as they want and crave. That, of course, is absurd. The calories will still be there.

Certain foods are, nevertheless, more concentrated sources of food-energy, or calories, than are others. The fats, for example, give you more than twice as many calories per unit of weight of food than do the proteins or carbohydrates. The pure sugars also provide more calories per ounce than do foods like lettuce, fruits, and vegetables which have a high water and fibre content.

For these reasons it is best to eliminate from reducing diets such concentrated sources of energy as fats, fried foods, sugars, candies, alcohol, pastries, nuts, and condiments. Butter and margarine (fortified) should not be omitted entirely from the reducing regime, because they furnish valuable vitamin A as well as other nutrients, but lard, vegetable fats and oils, and meat fats can be dispensed with to advantage.

Protein foods, such as meat, fish, milk, cheese, and vegetables and cereals are valuable in the reducing regime, because protein not only builds tissue, but has a sparing action on other types of food. Protein likewise has the power of stimulating greater use of energy by the body. As previously pointed out, protein through its specific dynamic action produces about 30 per cent more energy than would be expected from the actual amount consumed. Thus, 100 calories of protein gives not 100, but actually 130 to 140 units of food-energy.

Contrary to another common belief, carbohydrates in the form of starches and some sugars should be included in the sensible reducing diet. This is because fat burns best in the flame of the carbohydrates. It would not be possible, furthermore, to arrange a diet without carbohydrates, nor should you try to do so. Bread, cereals, potatoes, and solid vegetables should be present in limited amounts in your slimming regime.

Water and other fluids in normal amounts are allowable in this diet. After all, the human body is somewhat more than two-thirds water, and the daily loss of fluid must be replenished. In most cases the intake and the output remain in proper balance. At the beginning of a reducing regime there may be a temporary failure to lose because of retention of water in the tissues, but this should cause no discouragement. In a few days or a week the losses will begin, as a rule.

Adequate intake of proteins favors water balance in the body. Too much salt in the diet, on the other hand, tends to promote water retention. For this reason the reducer may cut down somewhat on the use of salt, especially if he or she has been in the habit of using large quantities. In very hot weather, it is best not to diminish salt intake too drastically, since much is lost through perspiration.

The change in diet sometimes causes constipation, particularly at the beginning of the regime. This is best controlled through dietary means, by the use of such mildly laxative foods as prunes, figs, apples, rhubarb, green leafy raw vegetables, yeast, and fluids. If such measures are not successful, mild laxative substances such as milk of magnesia may be employed in strict moderation. Drastic purging is never desirable.

The idea that routine use of laxatives and cathartics will help to keep down weight is a false one. The materials thus eliminated from the colon of the body

are simply wastes, left-over products from others which long since have yielded up fat to the body. The use of laxatives in a vain attempt to reduce is like locking the stable after the horse has been stolen.

The Protecting Foods

In order that the body may be adequately nourished during reducing, the diet should be constructed around such highly nutritive foods as pure milk and dairy products, fruits and fruit juices, eggs, green leafy vegetables, yellow vegetables, meats, enriched white bread or whole wheat bread, and limited amounts of whole grain cereals.

Whole milk may be replaced with buttermilk or skimmed milk, products which offer about half as many calories as whole milk, but contain all of the important nutrients of the milk except the fat and most of the vitamin A. Whole milk may be used in place of cream in coffee, which can be sweetened with saccharin instead of sugar, if sweetening is desired. Saccharin is a coal tar product, much sweeter than sugar, but devoid of calories, and harmless when consumed in moderate amounts.

Small amounts of butter or fortified margarine on bread are allowable, for the vitamin A value. It makes no difference what kind of bread is consumed, because all types, white, whole wheat, rye, gluten, have about the same caloric values. The possible advantage of whole wheat bread is that it has better protein and more roughage, while gluten bread is somewhat higher in wheat protein, a protein which must, however, be supplemented by milk in the diet in order to get full nutritional benefit from it.

Cheese, such as cheddar or other hard cheeses, or cottage cheese, is desirable for its protein and calcium. The cottage cheese is lower in both of these nutrients. A little ice cream does no harm, either, but only a little

should be taken, because of its relatively high caloric value.

Best fruits in the reducing diet are the citrus varieties, oranges, lemons, grapefruit, limes, and also tomatoes, pineapple, apricots, peaches, prunes, apples, bananas, and berries like strawberries. All are rich in vitamin C and some contain other beneficial substances, like the pectin which aids digestion. Certain fruits, like the avocado and the olive, are quite rich in fat, and so should not be eaten while reducing.

Leafy green vegetables are particularly useful in reducing diets because they are low in calories, but high in vitamins A and C, and in calcium and sometimes iron. Among the best for this purpose are lettuce, chard, kale, spinach, mustard greens, turnip tops, green peppers, cauliflower, cabbage, and celery. Many, or most of these should be eaten raw in salads, without rich salad dressings. A little vinegar for seasoning does no harm.

Other vegetables, especially the yellow ones such as carrots, squash, pumpkin, and corn, are appropriate. Baked potato is certainly allowable in reasonable amounts, but no fried potatoes.

Lean meats, including beef, pork, lamb, veal, fish, and poultry, belong in the sensible reducing diet. Canned fish containing much oil, such as sardines and tuna, are best omitted, but other lean fish go well, especially when broiled. Liver, kidney, and other meat organs should be consumed occasionally for their vitamins and minerals. Bacon is, in general, too fat, but an occasional strip may be eaten if the total day's calories are kept within reasonable bounds.

The foods mentioned should, of course, be spread over the entire reducing regime, and so selected as to make attractive and tasty meals. Thus, breakfast may consist of a fruit, an egg on toast, and coffee; luncheon

of a salad, bread and butter or margarine, a cup of buttermilk, and fruit for a dessert; dinner of a meat dish, a small amount of potato, green peas or beans, a salad, bread, a beverage (skimmed milk or coffee or tea or fruit juice), and a light dessert. The important thing is to keep down the calories in the total day's meals, but still obtain a full quota of the necessary proteins, vitamins, and food-minerals. On this procedure almost anyone can eat satisfactorily and grow slim.

Suggested menus for a sensible reducing diet are given on page 106 at the end of this chapter.

Exercise and Massage

Mild or moderate exercise is beneficial during the reducing regime, as it is at any time, but it is a delusion to think that exercise will or can have any appreciable effect on taking off excess weight. As an accessory to the right diet, it has some value, because exercise adapted to the individual aids muscle tone. It also stimulates the appetite, by the way.

The fallacy of exercise as a weight reducer is shown by the fact that comparatively few calories are needed for most physical effort. One ordinary slice of unbuttered toast, yielding about 60 to 65 calories, will furnish enough energy for a woman to do an hour's ironing, or for a man to walk a mile in a leisurely way. It is too much food which puts on or keeps up weight, not lack of exercise.

Strenuous exercise by well-trained athletes does, of course, help to maintain their normal weights. Such comparatively young persons seldom, if ever, need to reduce, although prize fighters and jockeys sometimes have to make certain weights for their contests. Often they do it by sweating out several pounds of water in a steam cabinet, which is a temporary and not a natural

weight loss.

In a fast game, race, or match, a well-trained athlete may lose a few pounds, partly through water loss, but he promptly regains it at the next meal. Violent exercise of the same type is inadvisable for middle-aged persons not in training, whether they are trying to reduce or not.

Massage is no more valuable than exercise in diminishing overweight. You can not roll or knead fat off the body, nor can you push it from one part of the anatomy to another. Good massage by a qualified expert has certain soothing and tonic qualities, as well as other benefits, but as a weight reducing method it is a myth. The same is, of course, true of the weird manipulations indulged in by some of the healing cults.

Baking or soaking in steam cabinets, hot baths, and similar contraptions may make you sweat and lose water, but they are not effective in real reducing. A cold bath or shower has some value in losing weight, since it steps up heat production in the body.

All of the lazy-man methods of trying to reduce are worthless. Once again I repeat that the only way to achieve the slender and graceful form is by curbing the calories.

Drugs and Reducing

Several years ago a drug was put on the market for reducing. Its principal constituent was a substance known as dinitrophenol, chemically related to dynamite. It speeded up body processes and caused rapid losses of weight—but it also caused blindness in many of those who were foolish enough to employ it.

Another dangerous substance, dangerous in the hands of anyone except an expert, a competent physician, is thyroid extract. This hormone stimulates body meta-

bolism and certainly burns away fat, but the risks of using it are tremendous. Under the constant, intimate supervision of a doctor (of medicine), thyroid substance may occasionally be used to advantage, but never by the layman without such supervision.

Equally potent, but in a somewhat different way, is the drug known as amphetamine, which allays or deadens the appetite. Under no circumstances should this be employed, except by direction of a physician, and in strict accordance with his instructions.

Most of the patent medicines, nostrums, and drugs now offered for reducing contain mixtures of thyroid, amphetamine, laxatives, and other potent substances. Often they are exploited in the form of various colored pills, to be taken at different times of the day. Sometimes these pills also contain sedatives to mask the unpleasant effects of what the American Medical Association calls, "this irrational mixture."*

Another type of nostrum advertised for reducing consists of vitamin, or vitamin and mineral supplements. With it goes a diet, usually a drastic one, which is guaranteed to take off seven or more pounds a week "or your money back." On a sensible reducing diet vitamin pills are seldom necessary.

Although the labelling, advertising, and to some extent the composition of such drugs are controlled under our federal and state food and drug laws, there are many possibilities of evasion of the law. The wise consumer will take care to shun all drugs offered for reducing purposes, unless carefully prescribed by a reputable physician. A few doctors, it might be added regretfully, are likewise deluded by some of these drugs.

* See Drugs for Obesity. *Journal of the American Medical Association*, June 7, 1947, page 527.

More complete, and authentic, information on reducing is given in the book, *The New Way to Eat and Get Slim*, by Donald G. Cooley. Wilfred Funk, New York, 1941.

A WEEK'S REDUCING DIET

The following diet for seven days offers from approximately 1,100 to 1,200 calories a day, together with an adequate supply of necessary protein, vitamins, and food minerals, as well as fluids and roughage. Such a diet will be successful in achieving a substantial reduction in weight in the average overweight person.

In using this diet the consumer is likely to obtain 100 calories above or below the computed figures, but that does not matter. In selecting foods or portions of foods, a little more or a little less than the true amount may be taken. The figures for the calories, while close to the actual food-energy values, are not and can not be exact or precise, for numerous reasons which have already been explained.

Proper substitutions in this diet, are, of course, allowable, but they should be of the same type of foods, giving approximately the same number of calories. Thus, berries in season, may appropriately replace other fruits; other solid vegetables may be used for potatoes; kidney may be substituted for liver; various types of lean fish could be taken in place of cod or halibut. The table of 100-calorie portions will be helpful in selecting proper substitutes for the sake of variety.

The diet may be repeated week after week, with or without substitutions, until the ideal or best weight has been achieved. The reducer should not bother to weigh himself or herself daily. Once a week is often enough.

If the diet is too low in calories for a particular individual, it can be increased by additions of foods, such as an extra slice of enriched or whole wheat bread and butter (about 100 calories), or by slight increases in the portions used. If fewer calories are permitted, smaller portions may be consumed, or one or two foods omitted, preferably in accordance with a physician's directions.

1. SUNDAY

Breakfast	*Calories*
Half medium grapefruit	100
One egg, cooked	70
Toast (enriched white, 1 slice)	65
Butter or margarine (1 teaspoon, or ½ square)	35
Coffee (black, no sugar)	0
	270
Dinner	
Tomato soup (no milk, 1 cup)	50
Roast chicken (lean white meat, 3½ ounces)	100
Baked potato (1 small white)	100
Green peas (¼ cup)	25
Salad, lettuce (4 leaves), pear (1), chopped green peppers	45
Buttermilk, or skim milk (1 glass)	90
Bread (whole wheat, 1 slice)	70
Butter or margarine (1 t.)	35
Gelatin dessert (unsweetened, 1 serving)	35
	550
Supper	
Bowl of graham crackers and whole milk (6 crackers, ½ pint milk)	470
Coffee or tea (black) if desired	
Total calories for day	1,290

2. MONDAY

Breakfast	
Sliced orange (1 small orange)	50
Oatmeal, cooked (½ cup)	80
Whole milk for cereal (2 ounces)	35
Toast (1 slice)	65
Butter or margarine (1 t.)	35
Coffee	0
	265

Luncheon	*Calories*
Fresh fruit salad ..... Lettuce (4 leaves), sliced banana (¼ banana), sliced apple (½ small), tomato (1 slice), celery cubes, lemon juice (1 tablespoonful)	80
Bread or toast (rye, 1 slice)	70
Butter or margarine (1 t.)	35
Buttermilk, or skim milk (1 glass)	90
	275

Dinner	
Lean lamb chop, broiled	100
Carrots, cooked (½ cup)	25
Green beans (½ cup)	25
Lettuce (4 leaves) with roquefort dressing	20
Bread, enriched white (1 slice)	70
Butter or margarine (1 t.)	35
Pasteurized whole milk (1 glass)	170
Dried apricots (10 halves)	100
Vanilla cooky (one)	100
	645

Total calories for day 1,185

3. TUESDAY

Breakfast	
Half cantaloupe	50
Bacon (2 slices)	200
Toast (1 slice)	65
Butter or margarine (1 t.)	35
Coffee, black	0
	350

Luncheon	*Calories*
Salad	135
Lettuce (6 leaves), cottage cheese (2 T.), pineapple (1 slice), grated carrot and grated coconut, salad oil or lemon juice	
Bread, rye (1 slice)	70
Butter or margarine (1 t.)	35
Buttermilk, or skim milk (1 glass)	90
	330

Dinner	
Consommé (1 cup)	25
Saltine (one)	15
Calves liver, broiled (1 slice)	100
Broccoli (½ cup)	20
Salad of chard, romaine, or endive, with French dressing	20
Bread, enriched white (1 slice)	70
Butter or margarine (1 t.)	35
Coffee and whole milk (1 T.)	50
Tapioca pudding (2 T.)	100
	435
Total calories for day	1,115

4. WEDNESDAY

Breakfast	
Stewed prunes (4 medium)	100
Shredded wheat (1 biscuit)	100
Whole milk for cereal, prunes, and coffee (2¼ ounces)	50
Coffee	0
	250

Luncheon	*Calories*
Tuna fish salad	100
Tuna fish (½ cup), lettuce (4 leaves), celery (¼ cup), mayonnaise (1 t.)	30
Bread, rye or whole wheat (1 slice)	70
Butter or margarine (1 t.)	35
Pasteurized whole milk (1 glass)	170
Coffee gelatine dessert (1 cup)	90
	495

Dinner	
Lean roast beef (serving 2½" x 1¾ x ¾)	100
Baked white potato (1 medium)	100
Kale (½ cup)	25
Bread, enriched white (1 slice)	70
Butter or margarine (2 t. for bread and potato)	70
Apple (1 raw medium)	80
	445

Total calories for day 1,190

5. THURSDAY

Breakfast	
Dried apricots (6 halves)	70
Egg (one medium, cooked)	70
Toast (1 slice)	65
Butter or margarine (1 t.)	35
Jam on toast (spread thin)	10
Coffee black	0
	250

Luncheon	*Calories*
Tomato juice (1 glass)	30
Cold roast beef sandwich:	
Slice roast beef	100
Bread, enriched white (2 slices)	140
Butter or margarine (1 t.)	35
Lettuce (2 leaves)	10
Buttermilk, or skim milk (1 glass)	90
Canned pear (one half pear)	30
	435

Dinner

Consommé (1 cup)	25
Lean pork (or veal) chop, broiled	200
Baked onions (2 medium)	50
Lettuce (4 leaves) and cucumber (4 slices)	10
Bread, whole wheat (1 slice)	70
Butter or margarine (1 t.)	35
Vanilla ice cream (½ scoop)	100
Tea, with lemon	0
	490

Total calories for day 1,175

6. FRIDAY

Breakfast

Peaches (2 halves)	100
Corn flakes (1 cup)	80
Whole milk (2½ ounces)	50
Toast (1 slice)	65
Butter or margarine (1 t.)	35
Coffee	0
	330

Luncheon	*Calories*
Consommé (1 cup)	25
Macaroni and cheese (¾ cup)	120
Watercress salad and hard boiled egg	80
Bread, enriched white (1 slice)	70
Butter or margarine (1 t.)	35
Fruit juice (grape juice or other, 1 glass)	120
	450

Dinner	
Clam broth (1 cup)	30
Fish, broiled or baked (cod, halibut, sole, etc., 1 piece 3¾ x 2½ x 1) with lemon	100
Boiled potato and parsley	100
Bread, enriched white (1 slice)	70
Butter or margarine (1 t.)	35
Buttermilk or skim milk (1 glass)	90
Apple, or peach, or pear (1 medium)	70
	495

Total calories for day 1,275

7. SATURDAY

Breakfast	
Orange juice (juice of 1 medium orange)	100
Oatmeal, cooked (½ cup)	80
Bacon (1 slice)	100
Toast (1 slice)	65
Butter or margarine (1 t.)	35
Coffee	0
	380

Luncheon	*Calories*
Tomato juice (1 glass)	30
Peanut butter sandwich:	
Peanut butter (1 T.)	100
Bread, enriched white (2 slices)	140
Buttermilk or skim milk (1 glass)	90
Stewed figs (two figs)	100
	460

Dinner	
Lean ham, cooked (1 slice)	100
Asparagus (6 stalks green)	15
Cole slaw (1 cup)	100
Bread, whole wheat (1 slice)	70
Butter or margarine (1 t.)	35
Coffee or tea (latter with lemon)	0
Pineapple (1 slice)	50
	370

Total calories for day 1,210

TABLE VI

100-Calorie Portions of Common Foods

Food	*100-Calorie Portion*
Apple	One large apple, 3¼″ diameter
Apple pie	Two-inch slice
Apricots	5 apricots (fresh), or 10 halves (dried)
Asparagus	15-20 large stalks
Avocado	1/5 of 3½-inch fruit
Bacon, broiled	3-4 small, or 2 large strips
Banana	One medium sized (3½ oz.)

Food	*100-Calorie Portion*
Beans, baked	1/3 cup
Beans, navy (dried)	1/8 cup
Beans, string	2-3 cups
Beef, dried	4 slices, or 1/8 pound
Beef, lean	1 slice, 3″ x 2½″
Beef, steak	1 slice, or 1/8 pound
Blueberries	1 large cup
Bread, white enriched	2 thin slices
Bread, whole wheat	2 thin slices
Broccoli	3 stalks 5½ inches long
Butter	2 small cubes, or 1 T.
Buttermilk	1⅛ cups
Cabbage, raw chopped	3-4 cups
Cantaloupe	1 melon 5 inches diameter
Carrots	4 or 5 average carrots
Cauliflower	1 small head, 4½ inches
Celery	24-30 stalks, or 4 cups
Cereals	½ to ¾ cup
Cheese, American (cheddar)	A little less than 1 ounce
Cheese, cream	2 T.
Cherries	1 cup, or 20 cherries
Chicken	3 slices, or about 3½ ounces
Chocolate, unsweetened	2/3 square, or about ½ ounce
Clams	6 medium sized
Cocoa	1 cup, or 4 T. powder
Corn, fresh	2 small ears, or 2/5 cup
Cornflakes	1¼ cups
Crackers, graham	2½ crackers
Crackers, soda	4 crackers
Cranberries	2 cups
Cream, light (20%)	3 T.
Cream, heavy (40%)	1 2/3 T.
Cucumbers	3 cucumbers, 7″ long
Dates	4 average dates
Eggs, boiled hen's	1 1/3 eggs
Eggs, scrambled	¼ cup
Eggs, yolks	2 yolks

Food	*100-Calorie Portion*
Figs	2 medium figs
Fish	1 small lean, or 4-5 ounces
Gelatin	3 T.
Grapefruit	One small, or ½ large
Grape juice	2/3 cup
Ham	⅛ pound
Ice cream, plain	¼ cup
Kale	2 1/3 cups
Lamb chops	1 average chop, ⅛ pound
Lemon juice	1⅛ cup
Lettuce	2 large heads
Liver	3 ounces
Macaroni	¾ cup
Margarine, fortified	2 small cubes, or 1 T.
Milk, whole	⅝ cup
Milk, skimmed	1⅛ cups
Milk, dried whole	3 T.
Oatmeal	¾ cup
Olives	8 large olives
Onions	3-4 medium onions
Orange	1 large, 2 small
Oysters	5 medium sized oysters
Parsnip	One 7″ long
Peaches	2-3 medium peaches (fresh), 4 halves (dried)
Peanuts	About 20 kernels
Peanut butter	1 T.
Pears	2 medium
Peas, shelled	¾ cup
Peas, dried	2 T.
Pepper, green	5 peppers
Pineapple	2 slices
Plums	4 average plums
Pork chop	½ chop, or ⅛ pound
Potato, baked white	1 medium potato, about 4 ounces
Potato, mashed	½ cup
Potato, sweet	½ medium

Food	*100-Calorie Portion*
Potato chips	1 cup
Prunes	4 medium
Radishes	36 average
Raisins	¼ cup
Rice, cooked	¾ cup
Rolls, white	1 medium roll
Salad oil	1 T.
Shrimp	1 cup, or 25 shrimp
Sirup	1½ T.
Soup	½ cup to 1 cup
Spinach, cooked	2 cups
Squash, summer	2/3 squash, or 19 oz.
Squash, winter	8 oz.
Strawberries	1 1/3 cups
Sugar, white cane (or beet)	4-5 cubes, or 2 T.
Tapioca	2 T.
Toast	2 small slices
Toast, French	1 slice
Tomato	2-3 medium sized
Tomato juice	2 cups
Turnips	4 average, or 3 cups cooked
Veal chop	½ chop, or 3 ounces
Walnuts	8-16 meats (½ oz.)
Wheat, shredded	1 biscuit
Yeast, dried	4 T.

WEIGHTS AND MEASURES

3 teaspoons, level (t.)	equal 1 tablespoon (T.)
2 tablespoons	equal 1 liquid ounce
4 tablespoons	equal ¼ cup
16 tablespoons	equal 1 cup (glass)
2 cups	equal 1 pint
4 cups	equal 1 quart
4 quarts	equal 1 gallon
32 ounces (liquid)	equal 1 quart
16 ounces (dry)	equal 1 pound (weight)
1 pound	equals 460 (453.6) grams
1 ounce	equals 30 (28.4) grams
1 kilogram (1000 grams)	equals 2.2 pounds
1 liter	equals 1.06 quarts
1 gram	equals 1000 milligrams

QUESTIONS

1. Why is obesity so dangerous?
2. How can corpulence be prevented?
3. What is the usual cause of overweight?
4. How can you determine your ideal or best weight?
5. Before reducing what precautions should be taken?
6. What is a reasonable number of calories in a reducing regime?
7. How are the calories computed for a reducing diet?
8. About how many pounds is it safe to lose a week?
9. What foods must be included in a reducing diet?
10. Why are protein foods especially desirable?
11. What foods should be eliminated from a reducing diet?
12. How much water is allowable?
13. Will exercise be effective in taking off weight?
14. Why should drugs not be employed in reducing?

The entire chapter provides the answers to these cogent questions.

CHAPTER 8

How to Put on Weight

PUTTING ON WEIGHT obviously is just the reverse of taking it off. Whereas obesity is generally due to lavish consumption of foods in excess of the body's capacity to burn them up in the form of necessary energy, leanness is usually caused by inadequate nutrition.

True leanness has been defined as the condition in which the weight is 15 per cent or more below the normal or ideal weight for the individual. In this country leanness is not, in general, as serious a problem as is overweight. There are, nevertheless, many persons who would profit by having more flesh on their bones, and who ardently desire to gain weight. As a rule, they can do so.

At the end of World War II most of the people of Europe were lean and hungry. Unlike the Americans, who have access to adequate food supplies (at relatively high costs), there was not much that the Europeans could do about improving their condition. Some scientists believe that persons who are constantly undernourished can adapt themselves to the status, but that they are likely to be smaller in stature, and that there will be a constant struggle for the survival of the fittest. That need not happen here.

Types of Leanness

Not all types of leanness are dangerous, although some certainly are. Moderate degrees of slenderness

are compatible with health, particularly in those persons who inherit spare figures and small bones. If such persons have solid and not flabby flesh, and good musculature, and if they exhibit endurance, stamina, and equable dispositions, free from nervousness, they are normal despite apparent underweight.

Such lean persons are what is known as the "sthenic" types, people who simply do not deposit fat. If, however, they are engaged in pursuits which require considerable physical activity, even they may be benefited by an increase in weight through an improvement in diet.

The asthenic type of leanness is something else again. Here we have persons who are not only underweight but are weak, both physically and emotionally. They suffer severely from the cold, they have a low resistance to disease, and they exhibit neurotic tendencies. They are irritable and unable to cope with the demands of life.

Another type of leanness is the kind which follows wasting illness. This is more of an emaciation than mere underweight, and usually can be corrected by careful attention to an upbuilding diet, together with proper rest and recuperation.

Some persons, particularly young women in quest of the sylphlike form, become too lean and slender through false notions that they must reduce. Loss of excess weight is, of course, desirable in many instances, but sometimes it can be carried too far, and sometimes the loss is neither necessary nor desirable.

Just as obesity, or gross overweight, is conducive to many unfortunate physical troubles and to a lessening of the span of life, so is serious leanness a physical hazard. The undernourished person is more likely to suffer from tuberculosis and to be more prone to infectious maladies. He is often constipated and is

frequently afflicted with digestive disturbances. The abdominal organs are often underdeveloped and the secretory functions may be poor.

In the asthenic type these conditions may cause a vicious cycle. Because of poor digestion the individual is afraid to eat satisfactorily, with the result that greater weakness follows and there is further impairment of digestion and other bodily processes. Treatment is called for, and usually can be successful.

In the more extreme cases of leanness treatment should be under the direction of a physician, and in many instances may well bein in a hospital where the diet can be controlled with exactitude. In some cases the use of insulin is desirable, since this hormone from the pancreas stimulates the appetite. With insulin the diet must be adequate and the patient under observation, which means that this drug should not be employed except under medical direction.

The Upbuilding Diet

Thin persons, particularly those of the asthenic type, usually have poor appetites. Aside from cautious use of insulin (only in special cases) the best way to promote a good appetite is through a liberal intake of thiamine, or vitamin B_1, the nutrient which also is conducive to good digestion.

At the beginning of an upbuilding regime the best method of getting thiamine into the system is through the use of dried yeast or vitamin pills rich in this vitamin. Thiamine may also be injected into the body by the physician. This vitamin is, of course, present in many foods, but the lean individual often refuses to eat them until his anorexia, or lack of appetite, has been overcome. Dried brewer's yeast, which contains more than enough thiamine for the day in one tablespoonful, can

be mixed with foods that are acceptable, or can be used with jam or jelly on bread and butter.

The best food sources of thiamine, besides yeast, are pork, liver, kidney, ham, whole wheat bread and enriched white bread, whole grain cereals and enriched macaroni and spaghetti, dried beans and peas, soybeans, peanuts, and oatmeal. Good sources are meats, eggs, potatoes, and solid vegetables.

Once the appetite has been established, and the lean person can be induced to eat satisfactorily, a substantial increase in the intake of calories will bring about a gain in weight. The total caloric value of his diet should be augmented by from 50 to 75 per cent over that to which he has been accustomed. This generally means that he requires from 3,500 to 4,000 calories a day, although he may have to work up gradually to this amount. For the first few days of the upbuilding regime 2,500 to 3,000 calories may be all that he can ingest, but at the end of a week the full quota can be taken, and with gusto.

In addition to the customary three meals a day the thin individual will profit from mid-morning and mid-afternoon snacks of nourishing foods, such as a glass of milk with some cream in it and two or three graham crackers or a light sandwich. He may also take a glass of warm milk and a few whole wheat or soy crackers at bedtime.

Adequate rest and repose are essential for the person who is trying to gain weight. He should obtain a full eight hours sleep at night, and will find, incidentally, that he sleeps better as his diet improves. He may advantageously take a rest or a nap after the midday meal. He should conserve his energy and not waste it on useless movements.

As weight is gained, moderate exercise should be added to the regime, in order to keep the muscles in

tone and also to aid in the stimulation of appetite. As pointed out in the chapter on reducing, exercise has practically no effect in keeping weight down when food intake is ample.

The best results are achieved when weight is gained gradually. In this way there is normal development of muscle and other tissue and restoration of anatomical structure. Putting weight on an asthenic is not a matter of rapid fattening, but of safe and sensible upbuilding, of improvement in the whole body.

What to Eat

The upbuilding diet must, of course, be high in both quantity and quality of foods. It must be nourishing as well as adequate, but it may be pointed out that it is much easier to obtain the necessary nutrients on an ample diet than on a restricted one. In a reducing regime great care must be taken to include plenty of protein, vitamins and minerals, but in the diet for gaining weight these are almost automatically included, at least after the diet really gets rolling.

Most important in all upbuilding diets are dairy products such as whole milk, cream, butter, cheese, ice cream, malted milk, etc. Not only are these valuable products rich in calories, but they offer high nutritive values, as well as palatability and ease of digestion by the average person. Large quantities of dairy products can be taken even when there is lack of appetite, and they can be taken equally well by those who think or imagine that they do not like milk, or that it disagrees with them. Unless there is a real and substantial allergy to milk, and not a fancied one, dairy products *must* be included in liberal amounts.

One of the many advantages of dairy foods such as whole milk and cheese is the protein, which is excellent

in both quality and quantity. Other desirable sources of this body-building protein are meats, poultry, fish, eggs, and vegetables such as dried beans and peas, soybeans, peanuts, and the whole grain cereals. The upbuilding diet should contain not less than three to five ounces of protein a day.

Fats and carbohydrates should likewise be abundant in this weight-gaining diet. Fats, which are especially high in calories, may be obtained from butter, margarine, cream, peanut butter, nuts, bacon, and meat fats, as well as from the use of lard and vegetable fats in cooking. The carbohydrates may be taken in the form of whole wheat or enriched breads and cereals, white and sweet potatoes, other solid vegetables, fruits, and sugar in reasonable amounts. Leafy green vegetables, yellow vegetables, and raw or dried fruits should be included for their vitamin and mineral contents, as well as for their roughage.

Since coffee and tea offer no calories, unless cream and sugar are added, the most appropriate beverages are whole milk, malted milk, chocolate milk, chocolate and cocoa made with milk, eggnogs, tomato juice, and fruit juices. For those who have no scruples against the moderate use of mild alcoholic drinks, it might be pointed out that beer and wine offer from 100 to 150 calories to the glass. The excessive use of alcohol is not, however, desirable either for supposed upbuilding or at any other time.

An Upbuilding Diet

The following diet for a week offers approximately 4,000 calories a day, selected from nourishing foods. It can, of course, be increased or decreased by adding or subtracting foods. Thus an extra slice of whole wheat, rye, or enriched white bread with butter would add

about 100 calories. This is not an inexpensive diet, but the price of health may be well worth it.

1. SUNDAY

Breakfast	*Calories*
Glass (8 ounces) orange juice	110
Oatmeal (¾ cup, cooked)	100
Cream (¼ cup) and sugar (2 T.)	200
Omelet (1 egg) and bacon (2 slices)	200
Toast, with butter (2 slices)	200
Cocoa (1 cup)	150
	960
Mid-morning (10 or 11 A.M.)	
Milk, with ½ cream (1 glass)	285
Dinner	
Tomato juice (1 glass)	60
Roast pork (2 pieces)	200
Scalloped potatoes (1 cup)	150
Lima beans (½ cup)	100
Salad, lettuce (6 leaves), tomato (1), dates (4), mayonnaise (1 T.)	300
Bread, whole wheat (2 slices), butter	200
Whole milk (1 glass)	170
Chocolate ice cream (¼ cup)	150
Cookies (2)	50
	1,380
Supper	
Toasted cheese sandwich (thick, ¼ inch slice American cheese, 2 slices enriched bread and butter)	500
Hot chocolate, with whipped cream (1 cup)	150
Apple pie (1 slice)	100
	750

Bedtime	*Calories*
Whole milk, ½ cream (1 glass)	285
Graham crackers (3)	100
	385

Total calories for day 3,760

2. MONDAY

Breakfast	
Half grapefruit, with sugar (1 t.)	125
Shredded wheat biscuit (1)	100
Cream (¼ cup) and brown sugar (1 T.)	150
Poached egg on toast, with butter	200
Toast and butter (1 slice)	100
Orange marmalade (1 T.)	85
Cocoa (1 cup)	150
	910

Mid-morning	
Milk, with ½ cream (1 glass)	285

Luncheon	
Cream of tomato soup (1 cup)	250
Cold roast pork (2 slices)	200
Creamed carrots (¾ cup)	100
Brown rice, steamed (¾ cup)	100
Salad, lettuce (6 leaves), pineapple (1 slice), cream cheese (1 T.), mayonnaise (1 T.)	220
Raisin bread and butter (2 slices)	230
Whole milk (1 glass)	170
Baked apple with cream (3 T.)	190
	1,460

Mid-afternoon	*Calories*
Soft drink (1 small bottle, ginger ale, cola, or other)	100

Dinner

Cream of celery soup (1 cup)	200
Lamb chops, broiled (2 chops)	200
Baked potato (1)	100
Green string beans, creamed (1/3 cup)	100
Ripe olives (3 olives)	50
Salad, lettuce (4 leaves), canned pear (½ pear), creamed cheese (1 T.), French dressing (1 T.)	200
Whole wheat bread, butter (2 slices)	200
Whole milk (1 glass)	170
Custard pie (1 slice 4″ diameter)	200
	1,420

Total calories for day 4,175

3. TUESDAY

Breakfast

Peaches and cream (1 peach, ¼ cup cream)	200
Corn flakes, cream and sugar (¾ cup)	200
Finnan haddie, butter sauce (¼ pound)	200
Toast, buttered (2 slices)	200
Strawberry jam (1 T.)	70
Coffee, with cream and sugar (1 cup)	50
	920

Mid-morning

Egg nog, made with milk and one egg	200

Luncheon	*Calories*
Consommé (1 cup)	25
Enriched macaroni and cheese (1 cup)	200
Tomato catsup (2 T.)	50
Salad, romaine (4 leaves), tomato (1), coconut shreds, mayonnaise (1 T.)	225
Rye bread and butter (2 slices)	200
Whole milk (1 glass)	170
Chocolate cream pie (1 piece)	200
	1,070

Mid-afternoon	
Buttermilk (1 glass)	90

Dinner	
Tomato juice (1 glass)	60
Saltines (4)	50
Sirloin (beef) steak (6 ounces)	300
French fried potatoes	200
Creamed spinach (¼ cup)	25
Salad, lettuce (6 leaves), orange (4 slices), apple (½), celery, mayonnaise (1 T.)	220
Enriched bread and butter (2 slices)	200
Whole milk (1 glass)	170
Apple pie and ice cream	250
	1,475

Bedtime	
Milk (1 glass), 2 graham crackers	240
Total calories for day	3,995

4. WEDNESDAY

Breakfast	*Calories*
Cantaloupe or melon (½ melon)	50
Enriched farina (¾ cup) with cream, sugar, and raisins	250
Toast, buttered (2 slices)	200
Marmalade (1 T.)	85
Hot chocolate, with milk, sugar, whipped cream (1 cup)	200
	785
Mid-morning	
Milk, with ½ cream (1 glass)	285
Luncheon	
Thick pea soup (1 cup)	170
Creamed salmon on toast	200
Baked potato	100
Cole slaw, with dressing (1 cup)	100
Whole wheat rolls, butter (2)	200
Whole milk, with chocolate (1 glass)	200
Fig and nut pudding, with cream and sugar (½ cup)	200
	1,170
Mid-afternoon	
Malted milk (1 glass)	250
Dinner	
Vegetable soup (1 cup)	100
Saltines (4)	50
Roast chicken (6 ounces)	200
Asparagus (6 stalks) on toast, with Hollandaise sauce	200
Potato chips (12 large)	100
Corn muffins, with butter (2)	200
Whole milk (1 glass)	170
Lemon meringue pie (piece 4″)	400
	1,420

Bedtime	*Calories*
Tomato juice, 2 soy crackers	100
Total calories for day	4,010

5. THURSDAY

Breakfast

Prunes (6 stewed, with juice, and cream)	200
Shredded wheat biscuit (1)	100
Cream for cereal (¼ cup) and molasses (2 T.)	225
Jelly omelet (2 eggs, 2 T. jelly)	350
Toast, with butter (2 slices)	200
Coffee, with cream and sugar (1 cup)	50
	1,125

Mid-morning

Buttermilk (2 glasses)	180

Luncheon

Consommé (1 cup)	25
Whole wheat crackers (4 thin)	50
Creamed chicken on toast	200
Grilled sweet potato, with butter (½ potato)	150
Salad, lettuce (6 leaves), avocado (½), and roquefort dressing	150
Enriched bread and butter (2 slices)	200
Chocolate malted milk (1 glass)	250
Rice pudding, with raisins and cream (½ cup	200
	1,225

Mid-afternoon

Grape juice (1 glass)	100

Dinner	*Calories*
Cream of tomato soup (1 cup)	175
Soy crackers (4)	75
Broiled ham (2 slices, 3 ounces)	200
Fried sweet potato (½), butter	150
Cauliflower (1 cup, creamed)	60
Fruit salad, lettuce, orange, apple, celery, etc., with mayonnaise	150
Raisin bread, butter (2 slices)	230
Sweet pickles (1 T.)	30
Whole milk (1 glass)	170
Custard pie (1 slice 4″)	200
	1,440

Total calories for day 4,070

6. FRIDAY

Breakfast	
Baked apple with cream	200
Griddle cakes (3 cakes 4″ diameter)	300
Maple syrup and butter	200
Cocoa, with milk (1 cup)	150
	850

Mid-morning	
Malted milk, added vanilla (1 glass)	250

Luncheon	
Clam chowder (1 cup)	90
Creamed oysters on toast (6 oysters)	250
Mashed potato, with butter	150
Green peas (¾ cup)	100
Cole slaw, with dressing (1 cup)	100
Hot biscuits (3), with butter	150
Honey (1 T.)	100
Cherry pudding, with whipped cream (3 T.)	150
Cocoa (1 cup)	150
	1,240

Mid-afternoon	*Calories*
Tea (hot or iced), with lemon and sugar	30
Vanilla cookies (3)	75
	105

Dinner

Tomato juice (1 glass), 2 wheat crackers	100
Swordfish steak (¼ pound), with lemon	180
Boiled potato, parsley	100
Spinach, with hard-boiled egg	130
Green salad, lettuce, watercress, cucumber, radishes, French dressing	150
Whole wheat bread, butter (2 slices)	200
Whole milk (1 glass)	170
Roquefort cheese (1 ounce) and crackers (3)	150
	1,180

Bedtime

Hot malted milk, 2 graham crackers	300
Total calories for day	3,925

7. SATURDAY

Breakfast

Orange juice (1 cup)	100
Oatmeal, cooked (¾ cup)	100
Cream (¼ cup) and sugar (2 T.)	200
Fried egg (1) and bacon (3 slices)	200
Doughnuts (2)	200
Cocoa, with milk (1 cup)	150
	950

Mid-morning

Milk, with ½ cream (1 glass)	285

Luncheon	*Calories*
Cream of celery soup (1 cup)	200
Soy crackers (2)	30
Baked beans, with pork (½ cup)	150
Tomato catsup (2 T.)	50
Cole slaw, with dressing (1 cup)	100
Boston brown bread, with butter (2 slices)	200
Cocoa (1 cup)	150
Apple pie (1 piece, 4″ diameter)	100
American cheese (1 square)	100
	1,080

Mid-afternoon	
Ginger ale (1 glass)	100

Dinner	
Fruit cup (1 cup)	200
Lamb stew (lamb, potatoes, carrots, peas, etc.)	400
Salad, lettuce (6 leaves), tomato, banana, coconut, mayonnaise	200
Whole milk (1 glass)	170
Rye bread, butter (2 slices)	200
Vanilla ice cream (¼ cup)	100
Chocolate cake (1 piece)	100
	1,370

Bedtime	
Hot malted milk, 2 graham crackers	300
Total calories for day	4,085

QUESTIONS

1. What is leanness?
2. What type of leanness is dangerous?
3. Define "sthenic" and "asthenic."
4. Why is thiamine helpful in the upbuilding diet?
5. What foods best provide this vitamin?
6. About how many calories should be included in an upbuilding diet?
7. What foods should be included in such a diet?
8. Why are milk and dairy products especially important.

CHAPTER 9

Keeping the Body Regular

IN THE COURSE of its daily activities the human body always accumulates a certain amount of waste materials. This waste consists not only of the unused and undigested residues of foods, but also of water, gases, salts, and of various other products of the metabolism, or chemical changes which are constantly occurring in the construction and destruction of our living cells.

The constant flow of materials through the human organism is, in fact, completed only with the elimination of those which are not used or are discarded in the process. In the normal body this evacuation of wastes is a more or less regular and routine function, although it may be temporarily disturbed or upset by various conditions.

Waste must, furthermore, be eliminated or disposed of regularly from the body, not merely because it is useless and takes up valuable space, but also because its retention for too long a time may be injurious. Many persons unfortunately suffer from troubles of elimination, particularly constipation, and sometimes in connection with the kidneys, yet in many or most instances these can be corrected and alleviated.

The Organs of Elimination

The end products of our metabolism are expelled from the body by a number of different organs. The

lungs, for example, get rid of carbon dioxide for us. They draw in, or inspire, air and remove from it oxygen, which is turned over to the blood to be distributed to the tissues. At the same time, the lungs extract the waste product, carbon dioxide, from the blood and release it directly from the body.

The liver also plays an important part in the elimination of wastes. This laboratory of the body converts various chemical products which come to it from the digestive processes via the blood, excreting substances into other organs, such as the kidneys and the intestines which communicate more directly with the outside world.

Contrary to common belief, the act of perspiring does not contribute to any appreciable extent to the elimination of wastes from the body. The primary function of sweating is to aid in the maintenance of proper body temperature. The sweat itself consists mainly of water with dissolved salt, although it does also contain some urea. The characteristic odor of the sweat, from certain parts of the body is not due to wastes, but to certain acids and other products from the skin. If, however, the kidneys fail to work normally, there ensues an increase in the urea content of the perspiration, but even then the amount of effective elimination here is comparatively slight.

Aside from the definite role played by the lungs, our principal methods of elimination are through the emptying at regular intervals of such hollow organs as the rectum and the bladder, the processes being known as defecation and urination, respectively. In connection with defecation we likewise speak of "bowel movements," the word "bowel" being applied to the intestines as a whole.

The lower, or large, intestine is in fact the gathering place of most of the solid wastes of the body. This is

the part of the intestines known as the colon, which continues from the coiled-up small intestines, and ends in the rectum, from which it is separated by a muscular valve, or sphincter. The chief function of the colon is to hold and move forward the wastes, or feces, until it is convenient to evacuate them.

During this holding process the fecal matter absorbs water, which changes it into softer, semi-liquid masses. None of this mass actually enters the rectum, an organ about six to eight inches in length, until immediately before the act of defecation. Its entry is a signal for evacuation, or it may occur as the result of an attempt to defecate.

In most normal persons who lead well-regulated lives the usual time for this act is immediately after breakfast. The urge comes as a matter of habit, because it is indulged every day at about the same time. It is also stimulated by the presence of food in the alimentary tract, with resulting motion, or peristalsis, of the stomach and intestines. The bowel has, furthermore, become active after the night's rest, just as the whole body has resumed its activity.

The passage of the feces into the rectum causes a sense of fullness, which in turn produces the desire to defecate. This is accomplished best by assuming a sitting position, the lower the better, and by straining, thus putting pressure on the abdominal contents. As a result of this pressure, additional feces are propelled into the rectum, the anal sphincters relax, and the movement is easily accomplished through the outer orifice, or anus.

It is all quite as simple as that, but many people do not find it so. Most healthy individuals have one or two bowel movements a day, but considerable variation from such regularity is not incompatible with health. Some persons always have a light movement one day

and a heavy one the next day. Some will defecate only once every two or three days, and yet they remain in excellent health.

The entire colon is not, as a rule, emptied during any one bowel movement. The remaining waste moves forward during the day, and more accumulates behind it, ready for expulsion in part the next morning. This is a natural process which does no harm whatever, since there is no real scientific evidence that the presence of wastes in the colon can possibly cause absorption by the body of toxins, chemicals, bacteria, or other dangerous products.

It is true, however, that persons who have insufficient or infrequent bowel movements, or who suffer from severe constipation, generally display certain well-defined symptoms. Among them are headache, malaise, a sense of dullness (hebetude), poor appetite, coated tongue, and halitosis, or bad breath. These conditions are not due to any auto-intoxication, or the absorption of toxins from the colon, but actually are caused by the pressure of the hard fecal mass on certain nerves, which communicate their distress to the sensitive parts of the body.

In the healthy, well-nourished individual whose elimination works with clock-like regularity the fecal material, or stool, is soft but well-formed, although the last part to be evacuated may be somewhat looser. It does not have an unduly strong odor. The highly malodorous stool generally indicates putrefaction, digestive disorders, or too infrequent elimination.

Foods for Regularity

The nature of the daily diet helps to govern elimination in most persons. If the diet contains the proper amount of roughage, of fluids, and of certain vitamins,

notably thiamine, evacuation is generally regular and easy. The well-balanced and adequate daily fare, one which provides sufficient protein, vitamins, and minerals, is also fairly certain to furnish sufficient roughage.

Fruits, vegetables, and whole grain cereals all possess indigestible fibres, the celluloses, which act something like a broom in the intestinal tract. Practically everyone needs some roughage for this mild sweeping action, although the desirable amount varies for different persons. Each must determine from experience, or by consultation with his physician, what is the ideal quantity in his own particular case.

Thiamine, or vitamin B_1, is necessary in the daily diet for many reasons, not the least of which is the favorable effect of this vitamin on the intestinal tract. It promotes good appetite and digestion by improving the motility of the alimentary system, and its presence in liberal amounts in the diet seems also to be effective in preventing constipation. In cases of beriberi, due to deficiency of thiamine in the diet, poor appetite and constipation are usually among the prominent symptoms, although they are by no means the only ones.

The best food sources of this important vitamin, thiamine, are dried brewer's yeast, pork and pork products, whole grain cereals, enriched breads and cereals, legumes such as soybeans, peanuts, peas, and beans, green vegetables, and meats. Products such as bran and wheat germ which are often successfully used in constipation undoubtedly owe much of their effectiveness to their abundance of thiamine rather than to the roughage which they contain.

Many foods exhibit natural laxative properties. Among them are such common products as yeast, prunes, rhubarb, figs, apples, oranges, the fermented milks (acidophilus, yoghurt, etc.), and lactose, or milk sugar. Honey has mild laxative properties, as does

chocolate. Fats slow up digestion somewhat, but they tend to keep the intestines open. An excessive amount of fat in the diet will, in fact, cause diarrhea.

Although many foods are laxative, the converse is not true, since no single food will cause constipation, especially when it is part of a mixed diet. Milk and cheese have often been accused of being binding, or constipating, but without justification. If an entire diet should consist exclusively of refined and bland foods which have little, if any, bulk or residue and a paucity of thiamine, such a total diet would be more than likely to give rise to stasis of the colon, or constipation. Individuals have, however, lived for years on diets of bread and milk without unfavorable effect on the intestines.

Constipation

Constipation, or costiveness, is the incompetence or infrequent emptying of the lower portion of the bowel. It means not merely a difficult defecation but an insufficient one. Some persons who have daily movements may suffer from colon stasis, while others who go to the toilet only once in two or three days do not have this affliction. It occurs more often, nevertheless, in those who are not regular, for one reason or another.

The causes of constipation are numerous. Many cases are due merely to dietary faults combined with lack of exercise; some are caused directly by the abuse of the body with too many cathartics and laxatives; other instances of constipation are due almost entirely to mental and emotional upsets, in other words, are purely psychic in origin. Some, of course, are combinations of these various factors. All of these are what may be called incidental rather than essential constipation.

More serious are the types of constipation which arise from organic diseases or defects in the body. Colon

stasis may be the result of an obstruction, such as a hernia or tumor, or of the displacement of some other organ in the body; it may be secondary to some other disease, such as heart trouble or lung trouble; or it may be aggravated by hemorrhoids (piles) or fissures in the rectum. All of these, and other morbid conditions should of course be under the care of a physician who can diagnose and treat the exact cause. He can determine the fundamental basis of the trouble by means of the X-ray and other suitable tests.

Habitual or chronic constipation caused by bad habits, including poor diets, lack of exercise, and the routine taking of laxatives, usually or often can be alleviated by a change of the daily regime. In the first place the sufferer should realize that failure to have a daily bowel movement will do him no harm at all. He should not get nervous or distressed about it, should learn to relax when going to the stool, and should understand that as diet and other conditions improve, the ability to defecate easily and naturally will also improve. It may, of course, take a little time to recondition the body along these lines.

Regularity in going to the toilet is particularly important. The best time for this event is immediately after breakfast, although an urge at any other time should be responded to as promptly as possible. Plenty of time should be taken under comfortable conditions. In cold weather, for example, the toilet seat should be warm. Men often find that the leisurely smoking of a cigar or pipe while on the stool adds to comfort and relaxation.

The daily diet of the constipated person should be rich in thiamine and in other vitamins. It should be comprised of an abundance of fruits and leafy green vegetables, as well as of whole grain cereals. Dried yeast may be added to the cereals, and bran or wheat

germ taken in moderate amounts. Some persons find, however, that coarse foods like bran are too irritating to the gastro-intestinal tract. If the individual is not overweight, or obese, a considerable amount of fat may be helpful.

A liberal intake of fluids is likewise of importance, since fluids help to soften the fecal mass. Water or other suitable beverages should be taken between meals, while milk, fruit juices, and chocolate should be consumed with meals. Some authorities believe that coffee and tea in large quantities are too astringent for constipated persons.

Moderate exercise is also helpful, since it gives tone to the muscles of the intestines. There is nothing better than walking, especially for the middle-aged individual. Bending exercises which affect the abdomen will frequently aid in proper elimination.

Despite this change in regime, success may not be achieved at first, particularly in those whose constipation has persisted for a long time. In that case the use of a glycerin suppository, inserted in the rectum, may bring about elimination. If that does not work, an enema may be desirable, if a movement has not occurred for forty-eight hours. An enema is simply the injection of a suitable fluid, such as warm soapy water or a salt solution, into the rectum.

Directions for the proper administration of enemas are given in the American Red Cross Textbook on Home Hygiene and Care of the Sick, a book worth having in any household.

Irrigations of the entire colon, advocated by many cultists and faddists, are usually not desirable, although they may be employed under certain conditions in accordance with the directions of a reputable medical practitioner.

Laxatives should not be used, as a rule, especially if

these drugs have been too frequently employed. The best natural laxative is agar, or agar-agar, a gelatinous substance obtained from Oriental seaweeds. This is not a drug, but a food which absorbs water and increases greatly in bulk, so that it sweeps through the intestine smoothly. From one to three tablespoonfuls may be taken daily, either straight or in a drink of water, although the exact dosage depends upon the need. During World War II this substance was difficult to obtain, since much of it came from Japan.

Dangerous Laxatives

Occasional use of mild laxatives and cathartics is harmless, but the regular employment of these drugs invariably does more harm than good. If a drastic purgative, such as castor oil, is taken the entire large intestine is emptied, and there is nothing left to move the next day. If this process is repeated, the intestine loses its natural motility or tone and constipation is promoted rather than prevented.

The use of chemicals and drugs to cause elimination likewise alters the nature of the secretions in the intestinal tract, a change which may lead to intestinal spasm. This also causes rather than relieves constipation.

Some laxatives interfere with the proper absorption of vitamins and other nutrients by the body. Thus, mineral oil, or liquid petrolatum, carries with it vitamin A as it drains through the system. This oil is effective as a laxative, but it has a propensity to leak, with results that may be acutely embarrassing to the consumer. Mineral oil should never be added to salads, but small quantities taken between meals may do no harm.

In addition to castor oil, olive oil, and mineral oil, laxatives and cathartics may be compounded of innu-

merable other substances, such as tincture rhubarb, licorice, senna, and cascara sagrada (the "sacred bark" of the American Indians). They may include various saline ingredients, such as Epsom salt (magnesium sulfate), Glauber's salt (sodium sulfate), Rochelle salt (sodium or potassium tartrate), or milk of magnesia and citrate of magnesia.

Still others include such organic compounds as jalap, papaverine, podophyllium, and phenolthalein. This last is definitely dangerous, since it can cause unpleasant skin conditions in susceptible persons and may also hurt the liver. It is, unfortunately, sometimes added to chewing gum or candy.

A less objectional type of laxative is psyllium seed, which has the advantage of the bulk of bran without the coarse and irritating properties of the latter. These seeds swell in the presence of water, giving off mucilaginous substances which have some effect in lubricating the intestinal tract.

In this country advertising for commercial laxatives has literally run riot. The claims made for them in magazines and in newspapers, and over the radio, often are exaggerated and uncalled for, and frequently are offensive. The object of this advertising is, of course, to sell the product of an enterprising manufacturer, whether it is actually needed or not. The normal, healthy person virtually never needs a laxative, and most persons are definitely better off without them. An exception to this rule may be made in the cases of elderly persons, who may often be helped and comforted by moderate use of laxatives.

Your Kidneys

No less important than the bowels in the processes of body elimination are the kidneys. These organs are, in

fact, just as indispensable to life as are the lungs, the heart, and the liver. Like the liver, the paired kidneys act as laboratories which receive, transform, and excrete certain substances.

These two bean-shaped glands lie in the back of the abdominal cavity. They are about four and a half inches long, two and a half inches broad, and an inch and a half thick. If one of them is removed or impaired, the other will carry on the functions of both. As in the case of the liver, most of which can be removed without harm, Nature provided an effective reserve force in these organs.

The kidneys receive blood and extract from its various wastes, including some of the residues of protein foods in the form of urea, various salts, and excess water. In this way the kidneys act as regulators of the composition of the blood, a function which is also performed by the liver. If, for example, the level of sugar in the blood rises too high, it is excreted by the kidneys, as in cases of diabetes. Similarly, the kidney gets rid of acids, and excess minerals.

The urine which is formed in the kidneys is passed through tubes known as ureters to the bladder, which serves as the reservoir for this fluid. When the bladder is more or less filled, the urge to empty it occurs. The urine is voided through another tube called the urethra.

When moderately distended, the bladder, located in the pelvic cavity, holds about a pint of urine, but it may contain more or less at any one time. The desire to eliminate generally comes when this more or less egg-shaped (when full) organ contains about eight ounces of fluid. During the course of a day the average healthy person will pass from one to one and a half quarts of urine, the precise amount depending on the nature of the diet, the climate, and other factors. Children void less in actual quantity than adults, but more in

proportion to their body weights.

Normal urine is a transparent liquid with an amber color and a characteristic mild odor. It has an acid reaction and is slightly heavier than distilled water, with a specific gravity of about 1.020. If it is darker or paler in color, or cloudy, or is highly odorous, or if the usual quantity is greatly increased or decreased, these may be signs of trouble needing medical attention.

Chemical analyses of the urine are helpful in the diagnosis of various diseases, not only of the kidneys themselves but of other organs. Such tests are useful, however, only if interpreted in conjunction with other symptoms and tests observed and applied by the physician familiar with the case. A mere urine analysis, as offered by some commercial laboratories of low standing, is more than likely to be valueless.

As in the case of other organs, the kidneys are subject to infectious inflammations, injuries, and other diseases and troubles. Some arise as the result of communicable diseases, others from organic or degenerative maladies, while some occur initially in the kidneys themselves. In most such instances special diets are necessary, but these should be prescribed by the doctor to fit the individual case. He will generally see to it that such diets are rich in vitamins and other necessary nutrients.

In the old days it was thought that an excess of protein in the diet was harmful to the kidneys. Thus, persons who were heavy consumers of meat were regarded as liable to kidney troubles. Modern science does not go along with this idea, and considers it false. The normal body can handle large amounts of protein without any harmful effect, and with no detriment to the kidneys.

Stones in the kidney are formed by the deposit of mineral salts, such as calcium or other oxalates, phosphates, and urates. Sometimes one particular type of

stone predominates, depending upon the cause of the condition, but usually these renal calculi consist of combinations of the various salts. They may form as the result of infections, urinary stasis or stagnation, defective diets, or for numerous other reasons. Occasionally, for example, stones may form in ulcer patients who take large quantities of alkalies every day. There is no evidence that an ordinary or even a large intake of calcium through the daily diet will give rise to renal stones, but there is some evidence that plenty of vitamin A in the daily diet will tend to prevent them.

Just as the business in laxatives flourishes, so does commerce in alleged "kidney purifiers." Various nostrums and patent medicines are advertised as "removing excess acidity" from the kidneys, or as flushing these organs. The normal kidney does not require such assistance, and the abnormal one should be under the skilful care of a competent physician, who will prescribe the proper remedies to treat the particular case.

Generally speaking, kidney troubles are not likely to occur in the individual who is consistently well nourished throughout life. The same is, of course, true of most other physical troubles.

Enuresis

Enuresis, or bed wetting, is a rather frequent complaint among young children, and an occasional one in adults. In children over two years of age this incontinence of the urine occurs most often in those who are overactive, nervous, and high-strung, who do not get enough rest, and who are improperly nourished. The condition may also be due to physical troubles, such as local irritations from various causes, which should be treated and removed by the physician.

Most normal children can be taught bladder control

by or soon after the fifteenth month of life. They should be carefully trained to empty the bladder at regular intervals. They should be encouraged to do this, but not scolded or chided for their failures. Nocturnal enuresis may sometimes be avoided by withholding all fluids from the child after 4 P.M., and giving him a dry supper, without added salt or sweets. The bladder should be emptied completely before retiring and then again one and a half hours later, the child being awakened for the purpose. Any abnormalities should, of course, be corrected.

QUESTIONS

1. What organs of the body are concerned with elimination?
2. Does perspiration play a part in this process?
3. Is a daily bowel movement essential for everyone?
4. What foods help to keep the body regular, and how?
5. Why are fluids necessary as an aid to elimination?
6. What vitamin is particularly helpful in this process, and why?
7. What foods possess natural laxative properties?
8. How does agar-agar operate in the body?
9. Are any foods actually constipating?
10. In what ways may ordinary constipation be alleviated?
11. What are the hazards of the laxative habit?
12. How do the kidneys function?
13. In what way may enuresis be controlled?

CHAPTER 10

Foods That Feed Your Blood

EVERYONE IS FAMILIAR with the appearance of that vital fluid, the blood. Most persons are aware that it flows or surges through our arteries and veins under pressure, from that remarkable human pump, the heart. Some people also realize that in its long and complicated journey through the body the blood conveys oxygen from the lungs to the tissues, and carries away waste products from them.

Beyond these facts, however, the average person seems to know very little about the composition and the functions of the blood, or about the care and feeding of this important and interesting red fluid. There are, furthermore, numerous misconceptions about the blood stream, which need to be cleared up.

Among these strange delusions are notions that certain foods will "heat" the blood, or will "dry it up," or will make it "thin," or will fill it with impurities. You often hear the phrase, "It made my blood run cold," which has no more basis of fact than the allegation that some favored individuals possess "blue blood." These last are, of course, allegorical terms, but some people believe them.

The condition of the blood can not be changed appreciably by the taking of any one food, although the nature of the total diet over a period of time certainly has a significant influence on it. Nothing short of death itself can cause the blood in the system to dry up; no food can heat it or chill it; as has been already

explained in a previous chapter, foods will not change the normal alkalinity of the blood under ordinary circumstances.

So, let us take a look at your blood supply, and see what are the real facts in the case.

Your Blood

Your blood is estimated to comprise about one-thirteenth, or about 7 per cent, of your body weight. Thus, a person with the typical weight of 150 pounds would have from eleven to twelve pounds of blood, or about five or six quarts, under ordinary circumstances. The quantity may vary somewhat without appreciably affecting health.

A pint or more of blood may be lost or removed from the body without serious harm to the normal individual. Following hemorrhage or a blood transfusion there may be some temporary weakness as a result of the loss, but the body promptly replaces this blood, completing the process within two or three weeks. Professional blood donors repeat their performances every few weeks without harm to the system.

In normal menstruation in women, which occurs every twenty-eight days, the loss of blood is only from four to six ounces a day. The body replaces this almost as soon as it occurs, the manufacturing centers being stimulated by this moderate loss. No special diet is, in fact, required at this time, unless the flow is abnormal.

When you cut yourself and blood appears, it looks like a thick red fluid. If, however, you put it under a microscope you will find that the blood is composed of solid particles suspended or floating in a watery liquid. The particles, comprising from 40 to 50 per cent of the blood, are of three types, the red corpuscles, the white cells, and the platelets.

The fluid part of the blood, or plasma, is about 90 per cent water, the remainder consisting mostly of proteins in colloidal suspension, which means that they will neither dissolve nor settle. It is this plasma which is now so successfully employed in blood transfusions. The fluid is collected from a number of different individuals, pooled under sterile conditions, dried and stored hygienically. It is then reliquefied with specially purified water and transfused directly into the body of the person needing it. During World War II this method saved a great many useful lives.

The Red Cells

Most numerous of the solid particles of the blood are the red cells or corpuscles. In one cubic millimeter of your blood are from four and a half to five million of these cells, which means that a mere thimbleful of blood contains literally billions of these little round cells. The white cells are much less numerous, averaging only about 7,000 to the cubic millimeter. Their principal function is to fight against the invasion of infecting germs.

The red cells are constantly being destroyed and reformed in the body, because they have important work to do and they get worn out in the process. It is estimated, in fact, that the average life of a red blood corpuscle is about six weeks.

The factory for the production of these red cells is in your bone marrow. If you split open one of the long bones, you will find a tube through the center, filled with a yellowish substance streaked with red. The yellow marrow is mostly fat, but the red marrow is the production center for the blood cells. The final breaking down or destruction of these red cells occurs mainly in the liver and spleen, but under normal conditions

there is always a proper balance between the manufacture and destruction of the red blood cells.

In these red corpuscles is a substance known as hemoglobin, which makes up about 95 per cent of the cell. It is comprised of the protein, globin, in combination with an iron-containing pigment, hematin, which gives the rich red color to the blood. But producing color is not the only function of this hemoglobin. It combines with the oxygen breathed in through the lungs, and carries it to the various organs and tissues.

The blood flows through hollow tubes of different sizes, some near the heart being as much as an inch in diameter, and others far away from the human pump being so small that the tiny cells have to elongate themselves in order to squeeze through the little capillaries, as they are called. From the heart the blood is pumped out, so that it gushes with some speed through the arteries, and then returns to the heart more leisurely through the veins.

The entire circulation of the blood may be accomplished in the average time of about one minute, although the trip to the most distant extremities and back may require a somewhat longer period. The speed of the blood depends, of course, upon the action of the heart, the condition of which may result in high or low blood pressure. If the arteries have become thick, as they often do in old age, the speed of the blood may also be changed.

Other substances besides oxygen are carried in the blood stream. It transports sugar in the form of glucose, which has been absorbed from the intestinal tract. It also conveys amino acids, the end products of the proteins in foods, and it carries mineral salts such as calcium and phosphorus, sodium and chlorine, iodine, iron, and numerous others. On its return trip it brings wastes, which are eliminated by the various appropriate

organs, such as carbon dioxide from the lungs, and urea from the kidney and bladder.

Despite all these efforts and duties the chemical character of the blood itself remains remarkably constant, provided that you treat it right. Both the salts and wastes in it help to keep it in proper balance, an equilibrium which can not be changed by any single food in a mixed diet.

Although the food-mineral, iron, is carried by the blood, most of it is retained for the use of the blood itself. Much of it is used over and over again, but some is lost during the process. This loss must be replenished, and if it is not a certain type of anemia may result.

Iron in the Blood

The amount of iron required daily for the blood is very small, but it is also very important. How small it is is shown by the fact that the safe quantity needed daily by the adult man is about twelve milligrams, or about 1/2500 of an ounce. This quantity is less than in the head of a pin.

There is some evidence that the male adult does not need this much iron, but it seems agreed that the adult woman must be supplied with not less than the twelve milligrams a day, and that during pregnancy and lactation she should have not less than fifteen milligrams a day. Young children can get along with a little less, but during the period of adolescence children require fifteen milligrams.

The newborn infant comes into the world with an extra supply of iron, derived from the mother during pregnancy. This reserve, which is Nature's method of caring for the situation, is about 45 per cent above the normal requirement. It is, however, rapidly depleted

during the first few months of life, especially since the baby is fed almost exclusively on milk, a food comparatively low in iron. In order to prevent anemia in infants, iron-rich foods such as egg, yolk, cooked and strained, are added to the diet by the third or fourth month. The cereals introduced into the baby's diet about the fourth month also furnish some iron.

Many foods contribute iron to the diet, but some are much better sources of useful iron than are others. Preeminent among the iron-rich foods is liver, which has a higher percentage than any other comestible, although dried beans, molasses, and egg yolk follow closely after it. Kidney and heart of meat are also good sources of food-iron, while dried yeast and wheat germ likewise have an abundance.

The whole grain cereals, such as oatmeal, whole wheat, and yellow corn, are excellent sources of iron. Of the fish, the oyster leads all others in this respect, while among the nuts the almond is the leader in its contribution to the hemoglobin of the blood. Among other foods high in food-iron are dried fruits such as apricots, peaches, prunes, figs, raisins, and coconut. Lean meats and red meat juices, turkey, enriched white bread, parsley, and many greens are other foods which furnish a goodly portion of iron to the body.

The average person could obtain his daily quota of iron by consuming a quarter of a pound of liver or half a pound of kidney, or by eating a generous bowl of oatmeal with raisins and cream, or by partaking of two slices of enriched or whole wheat bread liberally spread with peanut butter and molasses, or by indulging in half a dozen large oysters with tomato sauce and a few graham crackers On the ordinary mixed diet built around the basic and protective foods, there should be no paucity of food-iron for the normal person.

Some foods which were formerly thought to be excel-

lent sources of iron are now known not to be, chiefly because their iron is not readily available to the body. In this category is that old standby, spinach. To be sure, this green contains a considerable amount of iron, but it also contains oxalic acid, a substance which prevents the utilization of the iron by the body by combining with it to form insoluble compounds. Kale is a much better source of food-iron than is spinach. Milk is also better, although it has comparatively little iron, but all that it has is utilized.

In the regeneration of the blood iron is actually not the only factor. Another mineral, copper, plays a part although it does not happen to be a known constituent of the hemoglobin. Apparently the copper has a catalytic, or stimulating and accelerating effect upon the iron. The amount required is very small indeed, only a trace and hardly measurable.

There is very little, if any problem in getting sufficient copper in the diet. This mineral usually accompanies iron in foods, so that if the supply of iron in the diet is adequate, the amount of copper is fairly certain to be sufficient. Copper is, furthermore, often introduced into foods by modern methods of processing and even cooking. When milk is pasteurized, for example, or is evaporated, it picks up a little copper from the utensils and equipment used.

Anemia

If there is too little iron in the diet the disease known as nutritional anemia is the usual result. It occurs more often in women and children, but men are occasionally affected. The symptoms include paleness or pallor of the skin, tiredness and weakness, shortness of breath, palpitation, and dizziness, although some of these may be signs of other disorders and a true diagnosis can be made only by a physician who uses suitable tests.

Anemic conditions, in individuals may, however, be due to other factors. They may be caused by increased blood loss through hemorrhage, or destruction of red cells in the body as the result of disease or poisoning. Malaria, for example, is generally accompanied by anemia because of the presence of the parasites of this disease in the blood stream. Other infections and some organic diseases may likewise cause anemia.

Then, there are types of anemia due to depressed blood formation, or inability of the body to manufacture the red cells in proper quantities. The malady known as pernicious anemia is quite different from the nutritional type of anemia, and is caused by deficiencies in the red cells themselves accompanied by poor secretion of certain substances in the gastric juices.

In order to cope successfully with pernicious anemia it is necessary to supply an internal or intrinsic factor to substitute for that lacking in the gastric juice, and an external or extrinsic factor which is supplied by food. For this purpose liver extract has been found to be the ideal substance. It is most successful when injected into the muscles of the body.

Recently a vitamin of the B group known as folic acid has been discovered to be effective in treating certain types of pernicious anemia and some other diseases, such as sprue. This vitamin is found, as might be expected, in liver and also in deep green leafy vegetables, such as peas, asparagus, snap beans, chard, and our old friend, spinach. The deeper the green, the more of the vitamin, which seems to be associated with the chlorophyl or green coloring matter of the plant. Other good sources of folic acid are cauliflower, dry breakfast cereals prepared from wheat, and beef and veal. When used in the treatment of pernicious anemia, the vitamin is generally prepared in pure extract form, and should be administered by the physician.

Blood Clotting

In addition to their function in helping to control certain types of anemia, foods are also concerned in the proper clotting of the blood. When your blood escapes from a ruptured vessel it promptly coagulates. This is a very complicated process which serves to arrest the flow of blood and thus to prevent bleeding to death.

Both the cells and the blood platelets are involved in this process of blood clotting. For successful clotting, however, the blood must contain a substance known as prothrombin and also the mineral, calcium. The prothrombin is produced, in part at least, by the nutrient known as vitamin K. This newly discovered vitamin occurs most abundantly in foods such as kale, spinach, carrot tops, tomatoes, and liver. It is, moreover, formed in the body itself, so that normal persons rarely, if ever, suffer from any deficiency of it.

By means of pure extracts of vitamin K the occasional hemorrhages in the newborn can now be effectively treated. The other factor in blood clotting, the calcium, is obtained in the diet by means of such foods as pure milk and other dairy products, and green leafy vegetables.

Hereditary inability to clot the blood is a rare phenomenon in certain persons. These are the so-called hemophilics, or bleeders, exemplified by the members of the former royal family of Spain and the late czarevitch of Russia. The defect is inherited through the female parent, but is manifested only in the males of the family. It is said that the mad monk, Rasputin, gained his evil ascendancy over the Russian royal house by his alleged healing powers in this disease, although actually up to now no one has ever been able to cure it.

The foods that best feed your blood, then, are those which provide an adequate amount of assimilable iron,

some calcium, and plenty of the vitamins which are so important in so many of the bodily processes. These are, in general, the same foods that are conducive to all-around good nutrition, the kind of nutrition that invariably makes for optimum health.

QUESTIONS

1. What is the usual quantity of blood in the system of a normal person one pint ....., one quart ....., five to six quarts ....., eight to nine quarts .....? *See page* 149.

2. How much blood can be lost from the body without serious harm to the healthy individual: one gill ....., one pint ....., one quart? *See page* 149.

3. Which is more numerous in your blood the white ..... or the red ..... cells? *See page* 150.

4. Where in the body are the red cells manufactured, and how? *See page* 150.

5. Iron must be supplied to the blood from the foods that we eat. The amount usually required every day is 1 milligram ....., 12 to 15 mg. ....., 20 mg. .....? *See page* 152.

6. Which of the following foods are high and which are low in available iron for blood regeneration?

	High	*Low*
Spinach	.....	.....
Milk	.....	.....
Liver	.....	.....
Oatmeal	.....	.....
Limes	.....	.....
Molasses	.....	.....
Egg yolk	.....	.....
Ice cream	.....	.....
Apricots	.....	.....
Rhubarb	.....	.....
Whole wheat	.....	.....

Answers on page 153.

7. What other mineral aids iron in building good red blood: aluminum ....., sodium ....., copper ....., iodine .....? *See page* 154.

8. What substances are necessary for proper clotting of the blood? *See page* 156.

9. Is it true or false that:

a. Babies are born iron rich and calcium poor? ....

b. Oxalic acid in certain foods prevents proper utilization of iron in those foods? .....

c. All kinds of anemia are due to too little iron in the daily diet? .....

Answers on pages 152, 153, 154.

10. Where can you get folic acid and what is its function? *See page* 155.

CHAPTER 11

Nutrition for Nerves and Fatigue

AS LONG AGO as 1930, when the infant science of nutrition was still in its swaddling clothes, I wrote a magazine article entitled, "Nutrition and Nerves." It appeared in the late departed *Scribner's Magazine* for April of that year. The article was devoted to the thesis, then somewhat startling but now universally recognized, that what we eat or do not eat has a definite effect upon our mental and emotional life.

At the time of the publication of this opus, about two decades ago, relatively few persons among both the professions and the laity were willing to admit that diet had any influence upon so-called "nerves." Now they know better, because modern science has conclusively demonstrated the relationship.

During World War II much was made of the so-called "morale vitamin," which was needed to give us courage and stamina and mental stability. A whole industry was induced by science and government to enrich its products, flour and bread, with this vitamin so that the nutritional level of the American people would be stepped up. This vitamin was, and is, thiamine, or vitamin B_1. Back in 1930 thiamine had not been separated out from the vitamin B complex, and its true functions were not yet understood.

Thiamine is, however, not the only nutritional factor which is concerned in the promotion of a healthy condition of the nervous system. Other vitamins, certain

food-minerals, and the diet as a whole all play significant roles in mental hygiene.

Diet and Disposition

If thiamine is deficient in the diet, the person thus afflicted will soon display changes in his behavior pattern. He will become irritable, depressed, suspicious, inclined to quarrel, and generally neurasthenic. He will also show signs of weakness, lassitude, and fatigue; he will have difficulty in sleeping; and he will suffer loss of appetite. This thiamine-deficient individual will be extremely sensitive to noise and to trivial vexations; he will be tense about things, and his whole attitude will change for the worse. In addition to these mental disturbances, the sufferer will usually have such physical troubles as pain in the stomach, burning feet, and headaches.

When thiamine, or vitamin B_1, is restored to the diet, all of these distressing signs and symptoms will promptly disappear. This is fact and not theory, because it has been conclusively demonstrated by controlled experiments on human subjects at such medical institutions at the Mayo Clinic at Rochester, Minnesota, and the nutrition clinic a Bellevue Hospital in New York.

At the Mayo Clinic Drs. R. D. Williams and R. M. Wilder and their associates put a number of women volunteers on diets which were adequate in every respect except in thiamine. Their meals were attractive in taste and in appearance, their living quarters were pleasant, and the women were furnished recreation and diversions which should have kept them happy and contented.

They were happy enough when the test began, but after a few weeks on the thiamine-deficient diet all this was changed. They became depressed and quarrelsome, refused to cooperate, and threatened to strike. Great

tact and diplomacy were, in fact, necessary to keep them on the schedule agreed upon. Finally, open rebellion broke out among these human guinea pigs.

Then thiamine was given to all of them, and the mental difficulties disappeared almost overnight. Everything became serene as the subjects resumed their work and went about in a contented manner. Perhaps this is the answer to the industrial unrest with which our country is so often afflicted. Give the workers, and the employers, too, plenty of this particular vitamin, and they might get along in a more cooperative and harmonious spirit.

As a matter of fact, it has been done in several instances. At a national nutritional conference held in Washington, D. C., in May, 1941 Federal Security Administrator Paul V. McNutt told about a group of vicious, unreliable, agitating workers at the Tennessee Valley Authority who were regenerated by means of diet. When they were put on adequate diets, including among other things sufficient thiamine, these troublemakers ceased to make trouble. Given regular pay and hard work, along with proper food, they eventually became some of the best men ever employed at TVA.

In the disease known as pellagra mental disorders always occur. They begin with neurasthenia, including apprehension, fear, anger, hostility, irritability, and anxiety states, and progress with the progress of the malady to more severe psychotic conditions, which may be characterized by confusion, loss of memory, mania, delusions, and delirium.

Since pellagra is caused mainly by a deficiency in the vitamin of the B complex known as niacin, treatment with this nutrient usually brings a favorable response. If, however, the disease has gone too far, complete restoration may not be possible. Pellagra is, furthermore, believed to be due not merely to lack of niacin, but to

deficiencies in several of the B group of vitamins. Some of the mental symptoms may, therefore, be attributed to lack of thiamine.

Chronic alcoholics generally display mental disturbances, which are more likely to be due to malnutrition than to the effects of the alcohol itself, although this is a matter on which there is some difference of opinion. Alcohol is, of course, destitute of vitamins and often, in the case of chronic drunkards, it is substituted for food. What little food is consumed by these unfortunates can not be properly utilized by the body, because the constant flooding of the system with alcohol generally causes stomach troubles and the impairment of other vital organs.

The severe mental disorders described above are, in general, extreme cases which are caused by gross deficiencies in the vitamins. But many cases of neurasthenia, the mildest of the mental conditions, are undoubtedly due to an insufficient supply of thiamine and other vitamins in the daily diet. When the deficiency is corrected, the mental attitude of the consumer is often improved.

The weight of an individual may influence his mental condition. Very thin persons are likely to be nervous, morose, suspicious, and intolerant, especially if their thinness is of the asthenic type (see page 119). Corpulent persons, on the other hand, are usually jolly and good-natured, but they are seldom brilliant and ambitious. The people whose weight is normal, or ideal, are the ones who are most likely to be mentally well-balanced and emotionally stable. I say "most likely" because there are many exceptions to the rule.

Vitamins are not the only nutrients which affect the mental and emotional hygiene of the individual. Minerals may also play an important part in these processes of life. Thus, if calcium is too low in the diet, various mental troubles may occur, such as irritability,

incorrigibility, fatigue, and misbehavior.

In cases of nutritional anemia, due to insufficient iron in the diet, nervous and emotional disturbances often accompany the pallor, lassitude, weakness, and other symptoms of this malady. Whether these mental troubles are directly related to the anemia or not is something of a question, but at any rate they are often observed in this condition.

When iodine is too low, or is lacking in the diet, the disease known as simple goitre is the result of this deficiency. This is an enlargement of the thyroid glands which lie alongside the trachea, or windpipe, in the neck, the enlargement being caused by the attempts of the gland to extract iodine and manufacture the hormone, thyroxin. In mild cases no appreciable impairment of mental functions takes place, but in the more severe cases there is usually great reduction in mental as well as in physical vigor.

If children are born with hypothyroidism, or underactivity of the thyroid gland, and the condition persists, they are what is known as cretins. If untreated these children do not develop mentally or physically; not only are they smaller than normal, but their minds are generally those of an imbecile. Cretinism is comparatively rare in the United States, but is common in the goitrous regions of Europe, such as the mountainous sections of Switzerland. Today the disease can be successfully treated with thyroid extract.

Although the symptoms of neurasthenia and other mental illnesses can be definitely produced in an individual by means of a defective diet, one low or lacking in the B vitamins and in certain minerals, it should be emphasized at this point that mental troubles may and often do occur in well-nourished persons. These disturbances of personality, of emotions, and of the mind can not be cured by vitamins, but must be treated by

means of psychotherapy. Their origin is in the mental makeup of the individual, a product of heredity, early environment, and numerous other factors.

Mental Hygiene

Nineteen centuries ago the Roman satirist, Juvenal, gave us the much-quoted phrase, "*Mens sana in corpore sano*," or "a sound mind in a sound body." It is a nice axiom, but unfortunately it is not always true. Sound minds do not inevitably occur in sound bodies, nor do unsound minds always go with unsound bodies.

Mental disorders and disturbances range all the way from the milder neuroses, or psychoneuroses to the psychoses or insanities. In the former class are the "queer" personalities, or schizoid types, and those who are frustrated, perverse, moody, nervous, and emotionally unstable. In the latter class are the subnormal, such as the feebleminded, the idiots, and the imbeciles, and those who are abnormal. Some authorities put the supernormal, or the geniuses, among the psychotics, too.

Most of the insane must be and are confined to institutions, where they now occupy more than half of all the available hospital beds in the United States. During World War II somewhat over one-third of all the men rejected for service in the armed forces were turned down because of neuropsychiatric disorders, although of course relatively few of these were frankly insane.

Some types of mental disease arise from purely physical causes. Aside from those which are due to dietary deficiencies, other examples of these types are the general paresis, or so-called softening of the brain, which follows some years after untreated or improperly treated syphilis, the brain tumors, the injuries to the brain, the chronic alcoholism or use of narcotics, the senile decay of old age, and the virus infections which may reach the brain.

Some of these can be successfully treated, but some can not.

The functional mental disorders are those which arise from mental conflicts within the individual. Although these are, as a rule, purely mental in origin, they may show physical as well as mental symptoms. Many a bellyache and many a headache, as well as much of the fatigue and weakness with which some people are afflicted, are due not to physical causes but to these mental and emotional conflicts.

These functional mental disturbances are curable. They are treated successfully by medical specialists known as psychiatrists, or those who practice what is now called psychosomatic medicine. These troubles can also often be avoided or alleviated by the individual himself by the practice of good mental hygiene, or the art of living sanely. Relief from one of the milder forms of neurosis often prevents the development of a more serious mental affliction.

Mental hygiene means the ability of the individual to live a normal, healthy, sane life, with a minimum of conflict, and a maximum of emotional stability. It means the ability to adjust oneself at all times to the game of life, which often enough is a difficult game to play. It means the ability to enjoy life and live calmly and serenely, without undue excitement or hysteria. It is not always an easy thing to do, especially in these days of strife and turmoil, but it can be done. I assure you that it can be done.

Everyone suffers at one time or another from temporary ups and downs. Sometimes we are disappointed, discouraged, or depressed by events; at other times we are stimulated and elated. Often we think that we have been mistreated or imposed upon; occasionally we believe that our dreams have come true. These are not signs of mental abnormality, unless we permit these

thoughts to become exaggerated beyond the bounds of reality.

The cultivation of good mental hygiene should begin in childhood when personality and character are being molded and formed. The responsibility for such cultivation rests upon the parents, of course, who should be zealous in establishing healthy emotional lives in their offspring. One of the ways to do it is to set a good example.

In the old Germany, in the days before the advent of the psychotic Hitler, there was an apt proverb, "*Dem Glücklichen schlagt keine stunde.*" It means simply this, "For the happy, the hour never strikes."

Diet and Intelligence

Intelligence, or the capacity to understand and to apply the intellect, is an innate characteristic which varies greatly in different individuals. We are, or we are not, endowed with this quality by our inheritance, but intelligence can be cultivated by proper training if it is latent in a person.

During the period of growth and development the nature of the diet has a substantial effect upon the intelligence of the child, or at least upon his ability to make use of what he has. The well-nourished child generally has a keener mind than the poorly nourished one, and does better in his school work, as well as in all other school activities.

Recent interesting experiments have indicated that one of the amino acids of the proteins, a substance known as glutamic acid, may play a definite part in improving the mental ability of children. There is no evidence, as yet, that it can do the same for adults.

Apparently this nutrient, when fed in sufficient amounts as a drug under medical supervision, helps to

nourish directly the brain cells of the individual. It has proved successful in cases of mentally retarded children who were suffering from epilepsy. Perhaps this is the long-awaited "brain-food," but many further investigations will be necessary before we can say with assurance whether it is or not.

Glutamic acid occurs naturally in the proteins of such staple foods as milk, whole wheat, and dried beans, which have many other valuable dietary properties. This substance is, however, utilized by the body for many other purposes and at present is shown to benefit the brain cells of children only when it is in concentrated form. There is, furthermore, no evidence that the improvement is a permanent one.

The Control of Fatigue

In perusing this chapter you have noted, no doubt, how often the word "fatigue" occurs in connection with the dietary deficiency states. Weariness and lassitude are practically always symptoms, among others, of lack of vitamins and other nutrients. If you have too little thiamine in your daily diet, you tire easily; if you suffer from anemia, you are likely to be torpid; if you are generally malnourished, you will certainly be lacking in stamina.

Fatigue is also an accompaniment of nervous and mental troubles. Emotional upsets will tire you quickly and effectively. Worry, fear, anxiety, anger, and hallucinations and delusions are tiresome things, just as wearying as improper nutrition.

There is, of course, another cause of fatigue, and that is physical effort which leads more or less to exhaustion. Fatigue may, therefore, be classified as physical, mental, or nervous, although often it is a combination of these factors. Any and all kinds are preventable.

Muscular fatigue is, perhaps, the easiest type of tiredness to control. What happens is this: when you exercise, either by working or in athletics, the muscles involved use up oxygen and the carbohydrate known as glycogen, which is supplied for energy. At the same time waste products, such as carbon dioxide and lactic acid, are formed, along with inorganic phosphates from the organic phosphates in the tissues.

If the body can furnish fresh oxygen and new supplies of glycogen, and remove the wastes promptly, fatigue is avoided. It can do this in bodies that are accustomed to exercise, as in athletes who are in constant training, and in laborers who are inured to hard work. If the body can not keep up with the removal of wastes, they accumulate in the tissues and cause that tired feeling.

In this type of fatigue vigor usually can be promptly restored by rest and food. The sustenance replenishes the fuel needed by the system, and rest permits the oxygen to flow into the system more freely. When this occurs, the lactic acid itself serves as a source of fuel. Incidentally, the same condition of oxygen depletion happens at high altitudes and in persons exposed to rarefied atmospheres. Aviators and passengers who fly at 20,000 feet or more must be supplied with oxygen tanks, or otherwise they will suffer from exhaustion and possible blackouts.

It is dangerous to permit yourself to become too physically tired. Fatigue in the body lowers vital resistance, permitting the invasion of dangerous microbes, germs, and viruses. Weariness is likewise conducive to accidents, at least one-quarter of which are reliably estimated to be caused by too much tiredness in the human machine.

Strange as it may seem, idleness is just about as fatiguing as excessive physical effort. Any man or woman who has nothing to do, and lives an indolent,

sedentary life fags as rapidly and as easily as one who is continually active. Middle-aged persons who retire completely from all activities and occupations seldom live as happily or as long as those who maintain a salubrious interest in work and events. Older persons must, of course, taper off in their activities, but sloth is never good for them.

Hard work never injured anyone, provided that it is undertaken in a sensible way. When work is dangerous, monotonous, or unpleasant, or requires physical and mental exertion beyond the inherent capacity of the worker, then fatigue comes on rapidly. Boredom, frustration, irritation, and tenseness all deplete energy and cause weariness and lassitude.

Nervous fatigue is generally due to tenseness. The average motorist who drives his car through many miles of heavy Sunday or holiday traffic usually experiences this feeling of tenseness and reaches home, if he does, thoroughly worn out. Aviators who fly through fog without the most modern instruments generally get the same feeling, and land exhausted. These are the conditions which make for traffic and aerial accidents.

Mental fatigue results in muscular tension. The causes of such nervous fatigue are numerous and sometimes difficult to locate. Domestic strife may be responsible, and it is literally true that some people will make you tired, very tired indeed. Conflict, argument, anger, excitement, sex repression, and various other psychological causes are among the many breeders of fatigue, weariness, and exhaustion.

The wrong kind of noise is a frequent contributor to fatigue, as is also constant vibration. A sudden, unexpected noise startles the hearer and produces a defensive muscular response. If the noise is too loud or explosive in character it may even cause faintness and collapse. In many factories and machine shops the

continuous clatter of the machinery is more fatiguing than is physical and muscular effort.

The right kind of noise, of course, has the opposite effect. Soft, soothing music, with real lilt and rhythm and melody will help to counteract fatigue. Foot-weary soldiers who are trudging along can be perked up by the strains of martial music played by a good band. Blaring jazz, loudly emanating from the loud speaker of a radio, is usually not in a category of soothing music. It may, in fact, be a nuisance.

Modern civilization seems to have conspired to encompass us with a tiring environment. It gives us bright lights, which strain the eyes, it makes loud and raucous noises, it surrounds us with hurrying, often ill-mannered people, it furnishes us with blatant news which frequently may be distorted and more often than not is depressing. We can obtain relief from this unpleasantness either by escape to some rural haven far from the madding crowd's ignoble strife, or by adjusting ourselves to the hazards of civilization and making the best of a bad situation.

The healthy, well-nourished, serene person is the one best able to cope with this or any other situation. The individual whose weight is normal, who partakes of an adequate and well-balanced daily diet rich in all necessary nutrients, who lives a healthy emotional life, who avoids unnecessary and unseemly conflict, is the man or woman who can enjoy life and can also avoid chronic lassitude and fatigue. Naturally, he or she will get tired at times, but the weariness will be the salubrious type which quickly passes away.

Insomnia

Your day and my day is divided into three more or less equal parts, one devoted to labor and toil, another

to eating and recreation, and the final third to that condition of suspended animation known as sleep. Balm of hurt minds, it is sleep which, as Shakespeare says, "knits up the ravell'd sleave of care."

During this regular, rhythmic condition your body rests and recuperates from the stresses and strains and the multifold activities of the long day. During this unconscious state the cells in your quiescent body catch up on their building and repair. The kidneys, for example, work most efficiently while we are asleep.

By means of sleep fatigue is banished in the normal person. This is accomplished in a few hours, the remainder of slumber being pure luxury. Some people do, however, require more sleep than others. Young children who are growing need up to twelve hours or even more, while adults can get along on anywhere from four to eight.

Inability to sleep is known as insomnia. Most of us suffer from occasional disturbances of sleep, but true insomnia is relatively rare. The fear of insomnia causes more trouble than the condition itself. Most disturbances of sleep are, in fact, caused by anxiety, excitement, worry, and other mental troubles, although physical conditions such as severe coughing, indigestion, pain, constipation, cold feet, and noise, may also interrupt sleep.

Healthful, restful slumber can be lured in many ways. One method is to take a brisk walk under the stars and the moon before retiring; another is to enjoy the luxury of a hot bath; still another is to have a light snack of food at bedtime. A small amount of food at this time is effective because it seems to draw blood from the brain to the digestive organs, but a heavy meal at bedtime will have an opposite effect, disturbing rather than inducing sleep.

Best foods for this purpose are such light, bland ones

as warm milk or malted milk, with a few crackers, toast, or a light sandwich. A cup of warm soup may also be effective. Whether coffee taken at night affects sleep depends upon the tolerance of the individual. One or two cups, with cream and sugar, seldom causes trouble in a person who is used to coffee, but a considerable quantity of black coffee will keep most persons awake.

The bed chamber should be well-ventilated, the bed comfortable but not too soft, and the bed clothes neither too heavy nor too light. The position assumed for sleeping can be whatever suits you best, although it is better if it is neither too rigid and straight nor too bunched up, but something in between. For the normal person there is no harm whatever in reclining on the left side.

Once in bed the important thing is to relax. Even if you do not fall asleep at once or for a while, remember that mere rest in bed is beneficial. So, just lie there and relax, without worrying about any real or fancied difficulties in obtaining slumber.

Sleeping pills are unnecessary for normal persons, and they can also be dangerous. In some instances they may be used temporarily as a last resort, but they should be employed only on a physician's prescription, and then in the quantity and of the type that he suggests.

Blissful sleep will come naturally to any well-nourished, mentally serene individual who is pleasantly tired, and who permits himself to slip unresisting into the languid, drowsy arms of Morpheus.

Try repeating that phrase a few times when you go to bed. It is better than counting sheep.*

* Questions relating to this chapter will be found at the end of Chapter 12.

CHAPTER 12

Diet and Reproduction

THE RIGHT DIET is one of the most significant factors in the control of human fertility, fecundity, and reproduction. It is not the only factor in many instances, but sometimes it is the primary one.

In many families the control of infertility, or human sterility, is far more important than is birth control. It is estimated, in fact, that about one out of every six marriages in this country fails to result in live issues, with resulting disappointment, anguish, and sometimes divorce. This means that no children will be produced in about a third of a million of the approximately two million marriages celebrated annually in the United States. In the marriages legally dissolved by divorce each year, about three-fifths are childless.

The power to beget living offspring has long been recognized as intimately associated with nutritional efficiency. In the laboratory experimental animals can be made to reproduce satisfactorily or not to reproduce merely by certain changes in the nature of their daily diets. On the farms stock breeders know from long experience that animals will produce larger litters and more vigorous and healthy offspring if they are properly nourished.

In the human animal the situation is more complicated. Impotence and infertility may be due to any one or a combination of numerous factors, including not only the nutritional state but other biological, physical, and chemical conditions.

Several years ago a prominent physician studied the food habits of some two hundred women who had been unable to conceive children. He found that their diets were defective in many important particulars, some being low in calories and others deficient in proteins, vitamins, and minerals. When the dietary habits of these women were readjusted, so that they received nourishing fare, about eighty of them, or 40 per cent, become pregnant and bore children.

The blame for failure to produce issue should not, however, always be put upon the female partner. In at least 50 per cent of the failures the husband is at fault; thus it may be the male spouse who is most in need of a correction in diet, along with the other desirable improvements in his physical and mental hygiene.

The fertility of any union is, in fact, dependent upon the individual fertility of *each* partner. Sometimes a high potentiality in the one may compensate for some degree of inadequacy in the other, but if the sum of the two falls below the biological threshold, the result is infertility. This is demonstrated, among other ways, by the fact that a person may have no children by one marriage, but upon a subsequent marriage, will promptly conceive.

The Physiology of Reproduction

Nature herself has made successful procreation a bit difficult. Theoretically, there are only about thirteen days in an entire year when it is possible for the average woman to become pregnant. Actually, however, there is great variation in individuals, and the precise opportunity and time for this auspicious event can not always be determined.

Pregnancy can occur only at the time of ovulation in the female. In the normal woman this time is

approximately midway between the onset of the menstrual cycles, which take place every twenty-eight days, and last for three or four days. According to some authorities, ovulation in the woman continues at the proper period for only about twenty-four hours, or forty-eight at the most; according to others, the actual length of time in which the ovum is capable of fertilizing is only a few hours.

The ova, or eggs, develop in the woman after the age of puberty in the two paired organs known as the ovaries, which lie in the abdominal cavity near the pelvis. At regular intervals, about once a month, one or more of the mature ova rupture the wall of the follicle in which they are contained, and escape into the Fallopian tubes leading to the uterus. In the tube or in the uterus itself the egg may be fertilized by the male, but if this does not occur, the ovum disintegrates or is passed to the exterior.

In the male, sperm is produced in the glands known as the testes, or testicles, and is stored in a tortuous, coiled tube above them known as the epididymis. From here the sperm travels through a tube or duct, the seminal duct, to the urethra. On the way it gathers secretions from the prostate gland and the seminal vesicles, the combination of the sperm with these secretions forming the fluid called the semen, which is deposited in the female genitals by the act of coitus.

In elderly men the prostate gland often enlarges. Since this chestnut-shaped gland lies in front of the neck of the bladder and around the commencement of the urethra, its enlargement causes difficulties in the urinary process. In young men inflammation of the prostate may occur as the result of infections, particularly from gonorrhea, although also from other causes.

When sperm is deposited in the female, the spermatozoa migrate to the uterus and on up into the Fallopian

tubes. If they encounter a mature ovum fertilization takes place. The fertilized egg, or zygote as it is now called, returns to or establishes itself in the uterus and develops into the embryo. When this occurs normal menstruation ceases in the female during the nine-months period of pregnancy.

The quality of the male sperm has been shown to depend, in part at least, upon the nutritional state. If protein is low in the diet, the production and the motility of the sperm are lowered. The amino acid, arginine, one of the constituents of protein, has been demonstrated to be an important part of the sperm, and must be supplied to it through the daily diet.

If vitamins, particularly the B group of vitamins, are low in the diet the quality of the sperm is decreased, although the exact modus operandi is not yet fully understood. Lack or deficiency in vitamins has an adverse effect on ovulation in the female.

Vitamins for Fertility

When laboratory animals or cattle are deprived of vitamin A they soon become sterile or bear offspring that are feeble and die shortly after birth. Restoration of this vitamin to the diet makes possible successful reproduction and the rearing of the young, not only in the first but in successive generations.

If vitamin A is low but not completely absent from the diet, so that growth of the animal continues at what seems like a normal rate, there may, nevertheless, be interference with reproductive ability.

A liberal allowance of vitamin A in the diet is, therefore, necessary to proper fertility and reproduction, both in the lower animals and in humans. As previously explained, the best food sources of this nutrient are butter, fortified margarine, egg yolk, cod liver and other

fish-liver oils, milk, cream, and the green leafy vegetables. It is also present in yellow vegetables and yellow fruits.

Thiamine, or vitamin B_1, is another nutrient which directly affects reproduction. If animals are restricted in their supply of this vitamin, the reproductive organs, the testes and ovaries, show degenerative changes. Males lose sexual interest and females cease to display the estrual cycle, or "heat." Because of lack of this vitamin, their bodies can not produce the hormones needed for reproduction.

Women who suffer from beriberi, due to thiamine deficiency, are unable to bear children, as a rule. If the deficiency in the vitamin is not complete but only partial, children will be carried to term, but they will be born weak and usually will not survive for long. The nutrition of the mother is, then, an important factor in infant mortality.

Liberal amounts of thiamine, needed in the diet not only for successful reproduction but for many other reasons, are obtained from such foods as dried yeast, pork and pork products, whole grain and enriched cereals and breads, liver and kidney, legumes, properly cooked vegetables, and meats. This has been said before, but is worth repeating from time to time.

Degeneration of the sex organs occurs in the course of scurvy, the dietary deficiency disease caused by lack of vitamin C, or ascorbic acid, in the diet. An insufficiency of fruits and leafy green vegetables and other sources of vitamin C in the daily fare may, therefore, play a part in the ability to reproduce.

Finally, we come to a vitamin which is actually known as the "anti-sterility" factor. This is vitamin E, discovered in 1922 by Professor H. M. Evans of the University of California, who was studying the effects of various nutrients on ovulation. He found, as others had

found, that lack of vitamin A caused failure of ovulation in rats, but that when it was restored to the diet, along with the B vitamins, success was not achieved until another unknown factor was supplied. At first he called this factor "vitamin X," but eventually it came to be known as vitamin E.

Since that time much research has confirmed the fact that vitamin E is essential to prevent sterility in white rats, but it has not yet been proven that the vitamin plays any significant role in human nutrition. There have been a few reports on its successful use in preventing habitual human abortion.

As a matter of fact, vitamin E occurs so abundantly in many natural foods that any deficiency of it is extremely unlikely in the ordinary mixed diet. The best source of the vitamin is wheat germ oil, but it is also found in most seeds and green leaves, in whole grains, meats, milk, and in practically all vegetables. Until we get more conclusive scientific data on this vitamin, the best thing to do is to forget about it.

Other Nutrients and Fertility

Food-minerals, such as calcium, phosphorus, iron, iodine, sodium, potassium, chlorine, and numerous others, are required for various important bodily processes. If certain of these are lacking in the diet, reproductive ability may suffer. Cretins who are born with defective thyroid glands due to lack of iodine do not develop sexually.

Several years ago an avid press gave much publicity to a strictly scientific report which stated that the mineral, manganese, was necessary in the diet to promote proper reproduction and "mother love." The report stated that deprivation of manganese in the diets of laboratory animals resulted in sexual sterility in the male and delay

in sexual maturity in the female. If eventually she bore young, without manganese in the diet she refused to suckle them. Addition of this mineral to the diet brought about normal development through several generations.

On the ordinary mixed diet there is no more likelihood of lack of manganese than there is of vitamin E. The mineral is found abundantly in grains such as wheat, rye, barley, oatmeal, rice and alfalfa, and rather more sparsely in corn. It is also present in dry beans, lettuce, spinach, and many other vegetables and fruits.

The weight of the individual may have a bearing on fertility, as it does on health generally. The very thin and the very fat are less likely to possess efficient reproductive ability than are those whose weight is at or near normal. Protracted under-nutrition, as in times of famine and economic depression, always results in lowered fertility and an increase in the number of abortions, miscarriages, and stillbirths. Overnutrition has a similar bad effect. Obese women who are sterile often will become pregnant after weight has been satisfactorily reduced and general nutrition improved.

Excessive use of alcohol is believed to have a depressing effect upon the sperm in the male and ovulation in the female, at least in some individuals. Excessive use of tobacco is likewise thought to have some deleterious effect. In cases of sterility, alcohol and tobacco are usually banned, among other measures, although it is seldom likely that these two narcotics are solely at fault in the failure to reproduce.

From the standpoint of nutrition, therefore, an adequate but not excessive intake of calories, sufficient protein, plenty of vitamins, and a liberal supply of minerals are all necessary for effective fertility and reproduction. The function belongs not only to the generative organs but to the entire human organism,

which must be well-nourished in order to accomplish it.

Aside from a low level of nutrition, there may of course be other physical or mental causes of impotence or sterility. Although various methods of alleged rejuvenation have been touted from time to time, such as the use of goat glands, none of them works. Under the direction of a competent physician certain glandular products, hormones, and drugs may sometimes have a stimulating effect, and proper medical and psychiatric treatment may remove some of the causes of infertility which are beyond rescue by diet.

The Expectant Mother

After conception has occurred the diet of the pregnant or expectant mother is of tremendous significance to the fetus, or developing child, and also to the mother herself. The right diet may, in fact, mean the difference between an easy and successful birth and an unsuccessful one, and between healthy or unhealthy offspring.

Although this fact has long been recognized, it has been conclusively demonstrated in controlled investigations on pregnant women in Toronto, Boston, and various other medical centers. In Toronto Dr. J. H. Ebbs and his associates definitely showed that properly fed mothers were better obstetrical risks, that labor was shorter for them, and that their mental attitude was better. Those on poor diets during the prenatal period were more prone to anemia, toxemia, and threatened miscarriage.

The Boston investigators, Dr. B. S. Burke and his associates, showed that adequate maternal diets not only promoted safe pregnancies and prevented toxemia, but that children born to such mothers had fewer defects and were much more healthy than those carried by mothers on poor diets. Infants born to mothers with

the best diets were also larger and more fully developed. They were, in fact, superior children.

The function of gestation increases the nutritional need, particularly for such nutrients as protein, vitamins, and the minerals, iron and calcium. The total quantity of the diet need not be increased until the latter half of the nine-months period of pregnancy, when the usual intake of calories is augmented by about 20 to 25 per cent. Modern obstetricians endeavor, moreover, to keep down the weight of the expectant mother, since normal weight is more conducive to easy birth.

During pregnancy the requirements for protein is increased from the 60 grams needed by the normal woman to 85 grams a day, or from about two ounces to nearly three ounces daily. The best sources of protein in the diet are, of course, such animal foods as milk, cheese, eggs, and meat and fish, but cereals and vegetables also furnish good protein, which is better when supplemented with milk, since the milk supplies certain amino acids often lacking in the plant foods.

The expectant mother needs more of the vitamins every day than does the normal woman who is not pregnant. She requires about 25 per cent more vitamin A and at least that much more of the B vitamins, thiamine, riboflavin, and niacin. She should also have more vitamin C, or ascorbic acid, 100 milligrams a day as against 70 for the average woman. In addition, the expectant mother must have some vitamin D, from 400 to 800 units a day.

If the pregnant woman takes some cod-liver oil or other fish oil every day, she will obtain both vitamin A and vitamin D from this source. She can also secure these two vitamins from homogenized vitamin D milk, which usually contains 400 units of vitamin D to the quart. Appropriate sources of the B vitamins have been frequently set forth in this book.

Since the infant must be supplied with sufficient iron during its development so that it will have a reserve after birth for several months while it is on a milk diet, the mother's diet must be rich in this mineral. Where the usual minimum for the average woman is set at 12 milligrams of iron a day, the expectant mother must have 15. The sources of such foods have been fully set forth in Chapter 10.

The need for calcium by the expectant mother is nearly double that of the customary requirement, increasing from a little over three-quarters of a gram a day to one and one-half grams. The best food sources of dietary calcium, which is essential for the building of strong bones and sound teeth, are milk, cheese, and other dairy products, and the leafy green vegetables.

In goitrous regions the expectant mother may need a substantial increase in her intake of iodine, a mineral obtainable from fresh and canned fish and seafood, and also from iodized salt.

Since the expectant mother must eliminate the wastes of two, she must avoid constipation and maintain regularity of the bowels and kidneys. For this purpose, plenty of fluids and a moderate amount of mild roughage are helpful.

Every pregnant woman should, of course, be under the constant care of her physician, who will advise as to the best diet for her condition, as well as on other important matters of hygiene. Useful free pamphlets on prenatal and infant care may also be obtained from the United States Children's Bureau of the Federal Security Agency, Washington, D. C.

The Nursing Mother

After the baby is born it should be nursed at the mother's breast, which is the natural and ideal method

of infant feeding. The quality and to some extent the quantity of the mother's milk depend upon her daily diet, which must be higher in calories and even higher in the various nutrients than during pregnancy.

Even though breast milk is the ideal food for the infant, it is low in iron and contains very little vitamin C and vitamin D. Both breast and bottle fed babies must, therefore, be given supplementary feedings of fruit juices, such as orange, lemon, or tomato juice, and cod-liver oil or its equivalent, from the second week of life. Egg yolk, a rich source of iron, is added to the infant's diet at about the fourth month.

When a mother is nursing an infant, ovulation usually does not occur, although there are exceptions to this rule.

QUESTIONS

1. Is it true or false that:
   a. Lack of sufficient thiamine in the daily diet may lead to mental disturbances? ..... *See page* 160.
   b. All mental troubles occur only in poorly nourished persons? ..... *See page* 164.
   c. Adequate supplies of calcium in the diet aid mental health? ..... *See page* 162.
   d. Neuroses and psychoses are the same thing?..... *See page* 164.
   e. Glutamic acid can convert morons into geniuses? ..... *See page* 166.
2. List below six common causes of fatigue.

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.....
.....
.....
.....

Answers on page 168.

3. Which is better to assist in bringing on healthful slumber:

a. A meal of welsh rarebit, coffee, doughnuts, and chocolate cake just before going to bed, or

b. A glass of warm milk and two graham crackers?

Answers on page 171.

4. How many American families are estimated to be childless: one in three ....., one in six ....., one in ten ....., one in twenty .....? *See page 173.*

5. Which of the following vitamins and other nutrients are known to play a definite role in helping to promote human fertility?

Vitamin E	.....
Chlorine	.....
Riboflavin	.....
Vitamin A	.....
Calcium	.....
Manganese	.....
Thiamine	.....
Iodine	.....
Alcohol	.....

Answers on pages 176, 177.

6. Does gestation increase ..... or decrease ..... nutritional needs? *See page 181.*

7. The average woman requires 12 milligrams of iron a day. How much does a nursing mother need: 8 mg. ....., 12 mg. ....., 15 mg. ....., 20 mg. .....? *See page 182.*

CHAPTER 13

Building Better Teeth

No disease of civilized man is more common and more widespread than the affliction of the teeth known as dental caries. Millions of persons in this country, and in all civilized countries, suffer from this more or less preventable condition. Primitive races, untouched and uncontaminated by so-called civilization, seem to escape it.

Decay of our teeth is admittedly now only "more or less" preventable. Some cases certainly can be prevented, but the most assiduous application of modern scientific knowledge fails to avoid many instances of dental caries, possibly because heredity is at fault. On the other hand, it can be positively stated that better teeth, more resistant to decay, can be achieved by means of proper nutrition, provided that it is applied at the right time.

The most generally accepted theory of tooth decay is that it occurs most often in teeth which are defective in structure, and that it is initiated by the action of acids produced by the fermentation of certain carbohydrates by bacteria in the mouth.

The bacteria, or germs, responsible for this action are generally considered to be those of the acidophilus type, although streptococci have also been accused. These acidophilus bacteria are not the same as those in the commonly used acidophilus milk, although of the same family. This fermented milk can be consumed with impunity, and with no fear of deleterious effect upon the teeth.

The substances which are fermented by the bacteria to form acids are certain sugars and starches in foods. Thus, if pure sugar in the form of candy, particularly the hard candies such as lollipops, is permitted to remain in the mouth for long periods of time, fermentation is likely to occur with disastrous effects upon teeth which are weak in their inherent structure. Dry sugar is bad for the teeth, but when dissolved in a liquid, such as milk, it does less harm.

If the teeth have been properly developed, and are sound, strong, and regular, these troubles are much less likely to happen. It is the strong tooth rather than the clean tooth which does not decay. Cleanliness of the teeth and of the entire oral cavity is, however, a valuable adjunct in maintaining good teeth, but cleanliness alone will not prevent tooth decay. Some primitive peoples who have never heard of a toothbrush, much less ever used one, possess excellent teeth.

Your Teeth

Your teeth are part of the bony, or skeletal structure of the body, although the outer layer, or enamel, of the teeth is much harder than bone. The teeth consist of roots, which are set in sockets in the upper and lower jawbones, of crowns which protrude above the gums, and of necks which connect these two parts and are enveloped in the gums.

Each tooth is comprised mainly of a substance known as dentine, which surrounds a cavity, the pulp cavity running from the root to the crown, and holding blood vessels and nerves. The crown is covered with enamel, and the root with cement, all of these substances being harder than bone. They are, however, made up of the same mineral, principally calcium and phosphorus, as are our bones.

During life we have two sets of teeth, first, the deciduous or temporary teeth, and, second, the permanent set. In the first set are twenty teeth, ten in the upper and ten in the lower jaw. Occasionally a child is born with one or two teeth, but usually they do not appear until after the sixth month of life. It is said that Louis XIV of France was born, in 1638, with two teeth, with which he promptly bit his wetnurse.

As a matter of fact, everyone is born with teeth. They may not be showing, but they are present, nevertheless, below the gums. Our first teeth are formed in the fetus during the prenatal period; how good they will be depends in part upon heredity, but in greater measure upon the nature of the diet of the mother during pregnancy.

The first teeth to appear in the baby are usually the two lower middle ones, the incisors, which generally come through some time between the sixth and the ninth month of life. These are followed by the two upper central incisors at about eight to ten months. These incisors are eight in number, four in the mid section of each jaw, but the lateral or side ones do not come in with the others. They appear from the tenth to the fifteenth month, the upper ones preceding the lower, as a rule. About this same time the four first, or anterior, molars break through. These molars are teeth with broad crowns for grinding, whereas the incisors are mainly for cutting food.

After the advent of the lateral incisors and the first molars there is a pause of about six months until the four canines come into place, generally between the eighteenth and twenty-fourth months. These are cutting teeth like the incisors, the upper ones being popularly known as the "eye" teeth, and the lower as the "stomach" teeth. The last of the first set of twenty to appear are the four second, or posterior, molars, at about

two or two and a half years.

The times and the orders of appearance of the teeth as thus given are the averages in the normal child, but there is much variation in individuals. Some get their teeth earlier, some later, and the order differs. These are facts which need not disturb the parent, but if no teeth whatever have erupted by the end of the first year, it is best to consult the family physician and find out, if possible, what is holding up the process.

When a new tooth is breaking through the gum the process is somewhat painful. The baby may, therefore, be irritable and fretful and may not eat as well as usual. Despite popular opinion to the contrary, teething does not cause illness or disease, and in most well-fed infants it is accomplished without much difficulty.

The first or temporary teeth deserve the same type of careful attention that is customarily given to the second or permanent set. They should be kept clean and should have regular dental care, with any necessary fillings of cavities or straightening. If the first teeth are properly developed, the permanent set are likely to be more regular and stronger. During the period of the growth and development of these teeth the nature of the diet is of paramount importance, not only for them, but for the permanent teeth which are behind them. Both sets must be properly nourished.

During childhood our temporary teeth are replaced with those which must last the individual throughout life. In the permanent set are thirty-two teeth, a dozen more than in the first set. The twelve new teeth include the eight bicuspids behind the canines, and the four third molars, or "wisdom" teeth. The whole permanent set develops over the course of the years from the sixth to as late as the twenty-fifth year.

The first of the permanent teeth to come in, at about the sixth year, are the first molars. In the following

year, or thereabouts, come the incisors, with the bicuspids showing up in the ninth and tenth years. The canines appear during the twelfth to fourteenth years, the second molars about the same time or a little later, and finally, the third molars any time between the seventeenth and twenty-fifth years.

To sum up, the average normal child should have six teeth at one year of age, twelve teeth at a year and a half, sixteen teeth at two years, and the full twenty at the end of two and a half years. He begins to lose these temporary teeth at about the sixth year and continues to lose them until they are replaced by the permanent set.

Feeding the Teeth

Since the bony structure of the body is made up of calcium and phosphorus, these minerals must be supplied to the teeth during the period of their growth and development. The expectant mother requires at least one and one-half grams of calcium a day, while the nursing mother needs more, about two grams daily. In either condition the mother must have not less than one and one-half grams of phosphorus a day.

Phosphorus is so widely distributed in natural foods that there is little, if any, likelihood of a deficiency in this mineral, but calcium is another story. The best food sources of both of these minerals, in the proper ratio for the best utilization by the body, are pure milk and dairy products, particularly the hard cheeses. Six glasses of whole milk a day will furnish enough calcium to the pregnant or lactating mother, and with it enough phosphorus. Other foods rich in these minerals include green vegetables, nuts, molasses, seafoods, cereals and wheat products, enriched bread made with milk, and oranges.

The growing child needs a little less calcium a day than the expectant mother, about one gram. This he can

obtain from a quart of milk. After the age of twelve, as the adolescent period is entered, the requirement for calcium rises a little. Beyond the age of twenty the adult can get along on a little less than a gram a day of calcium and the same amount of phosphorus.

It is not enough, however, merely to get these minerals in the daily diet. They must be absorbed by the body and made to deposit properly in the bones and teeth. For this purpose vitamins C and D are necessary. Another nutrient, vitamin A, also plays a part in the proper development of our dental structures.

If there is a shortage of vitamin C, or ascorbic acid, in the diet the teeth and gums are among the first organs of the body to be affected. In cases of scurvy, due to lack of vitamin C, a loosening of the teeth occurs, along with swollen and bleeding gums. Investigations have shown, furthermore, that this vitamin is necessary for a healthy condition of certain tooth cells, the odontoblasts which are the nutritional connection between the pulp of the tooth and the dentine. Lack of vitamin C also affects the proper calcification of the cement in the base of the teeth.

As previously pointed out, the best food sources of ascorbic acid are the fruits and leafy green vegetables. It is most abundant in the citrus fruits (oranges, lemons, grapefruit, limes, etc.) and in tomatoes, but it is also obtained in the diet from potatoes, cabbage, onions, liver, and other foods, and in small amounts from milk.

Vitamin D is even more important to the bones and teeth, since this vitamin is essential to proper utilization of calcium and phosphorus by the body. Precisely how vitamin D mobilizes the minerals in the bones, whether by promoting absorption from the intestines or in other ways, is not yet known, but there is no question whatever about the fact that it does so. If vitamin D is lacking in the diet of the expectant mother and of the infant,

the bone disease known as rickets will occur in the child, even if plenty of calcium and phosphorus are available in the body. The teeth will also suffer in the absence of this vitamin.

The 400 to 800 International Units of vitamin D required daily by expectant and nursing mothers and by all infants under one year of age, and the 400 units needed as a minimum by all growing children can be obtained from such products as cod-liver oil, one teaspoonful of which yields 450 units of vitamin D or even more; other fish-liver oils, such as those from the halibut and the percomorph fishes (mackerel, bass, etc.), which are even richer in the vitamin than is the cod; homogenized vitamin D milk, which contains at least 400 units to the quart; and, finally, from the action of sunlight on the human skin. The ultraviolet rays of the sun convert substances known as sterols in the skin into vitamin D in amounts that are adequate, if not exactly measurable.

A few foods, such as butter, egg, yolk, canned salmon, seafoods, and milk, have small amounts of vitamin D, but most natural foods are lacking in this nutrient.

Equally important during the formative period of the teeth is vitamin A. Some authorities believe, in fact, that this vitamin is even more essential to the teeth than any of the others. If it is lacking in the diet when the teeth are being laid down, degeneration of the enamel occurs, with shrinkage and shriveling of the odontoblasts, and eventual breaking down of the dentine and cement.

This vitamin is procured in the diet from cod-liver oil and the other fish-liver oils, from butter and fortified margarine, cream, milk, green leafy vegetables, yellow vegetables and fruits, liver and kidney of meats, and in lesser amounts from various other sources.

From this collection of facts it is obvious that proper feeding of the teeth must begin in the prenatal period

and continue throughout the early months and years of life. The expectant mother will build strong teeth for her baby if her daily diet contains an abundance of such protective foods as cod-liver oil, milk, butter, eggs, fruits, green and yellow vegetables, whole grains, liver, and meat. The newborn infant must subsist mainly on milk, preferably from the maternal fount, but his diet in any case must be supplemented after the second week of life with cod-liver oil or its equivalent, and with orange juice or its equivalent. Later he gets egg yolk and other solid foods.

Even if the child is so unfortunate as to have a poor dental start because of a defective diet in the mother, something can be salvaged during the period of growth by means of an adequate and well-balanced daily fare. Tooth decay may occur at any time in life, but it is most prevalent during childhood. When the teeth are fully formed, at about the age of twenty, diet no longer plays a very positive role in keeping them in condition.

Diet may, however, play a negative role with respect to the teeth of adults. If diets are defective the teeth will be adversely affected, but good diets will not restore them later in life. Satisfactory nutrition is, of course, necessary for many reasons, but the time to apply nutrition to the teeth is during their formative period. That has been said before, and is repeated deliberately for emphasis.

The old adage, "a tooth for every child," has long since been disproved. The pregnant mother will not and need not have trouble with her teeth, especially when her diet is adequately supplied with calcium and phosphorus and the vitamins. Even if calcium is low in her diet, she furnishes the fetus with calcium drawn from reserves in her bones and not from the teeth.

Fluorine and the Teeth

Fluorine is a mineral belonging to the same chemical series as iodine, chlorine, and bromine, which are known as the halogens. It is found in sea water, in some water supplies, and in plants. It is also a constituent of the enamel of the teeth. If it is present there in the right amount it protects the teeth against decay, but if too much is present it causes a condition known as " mottled enamel," in which dull, chalky white patches appear on the teeth with deterioration of the enamel and an increase in decay.

This mineral may, nevertheless, prove to be a solution to the vexing and widespread problem of dental decay. Investigations have shown that if community water supplies contain no more than 1.0 to 1.8 parts per million of fluorine, the prevalence of tooth decay is drastically reduced among the children who drink that water. Dental caries does not disappear, but it diminishes by more than half, as compared to children who use waters containing very little fluorine.

In order to test out this procedure water supplies in a number of American communities have been dosed with one part per million of fluorine, this low figure being used in order to avoid any possibility of mottled enamel. Several years must elapse before the final results of this innovation can be reported scientifically.

Solutions of fluorine, usually dilute sodium fluoride, have been applied by dentists direct to the teeth of children, with equally favorable results. This method does not prevent all cavities in all cases, but it accomplishes a great reduction in dental decay. It is, of course, a method that can be employed only by the dentist, since improper use of fluorine is dangerous.

Further investigations are necessary to determine whether the action of fluorine is basically a sterilizing

one, or whether the mineral is fundamentally a factor in building stronger teeth. It might even be a combination of the two.

The newer evidence regarding the role of fluorine in the prevention of dental decay does not in any way alter the principle that a correct diet, rich in vitamins A, C, and D, and in calcium and phosphorus, is necessary during the period of tooth formation for the building of strong teeth. Fluorine will not come to the rescue of teeth that are built on a poor foundation. It is an added factor, but not the only one.

Sometimes when iron is taken in the form of medicines or so-called tonics, the teeth become stained. Other than this, the iron does no harm to the teeth, and will not cause decay.*

* Questions pertaining to this chapter are included among those at the end of Chapter 14.

CHAPTER 14

Eating for Personal Beauty

SINCE THE DAYS of the ecstatic Song of Songs of Solomon man has sought to define that "strange rapture called beauty." Definitions of beauty have found expression in the enduring works of poets and authors, of painters and sculptors, of architects and composers, of anatomists, philosophers, and even of physicians.

Physical beauty is an assemblage of graces which satisfy the eye and cause delight in the beholder. In a woman it includes symmetry of form and graceful movement, with pleasing features and various other characteristics of charm and comeliness. It includes hair that is lustrous and luxuriant; eyes that are bright; a complexion that is clear and smooth with natural color; teeth that are regular and white; the whole blended in well-molded features.

"Behold, thou art fair, my love; behold thou art fair," wrote Solomon some two thousand or more years ago; "thou hast dove's eyes within thy locks; thy hair is as a flock of goats that appear from Mount Gilead. Thy teeth are like a flock of sheep that are even shorn. . . . Thy lips are like a thread of scarlet. . . . Thy temples are like a piece of pomegranate within thy locks."

True beauty is, of course, more than skin deep. It comes from the soul and is enhanced by the attitude of mind. Persons who lack some of the physical attributes of beauty are, nevertheless, beautiful because of their mental serenity, altruism, poise, and esthetic qualities.

Many things may ravish or despoil beauty. Among them are disease and malnutrition. Conversely, good health and good diet are contributors to physical attractiveness. After all, the hair, the eyes, the skin, the face, the form are all parts of the body as a whole. What affects the entire body affects its parts.

How good nutrition builds and influences teeth during the prenatal period and the time of growth has been described in detail in Chapter 13. Let us see, then, how the nature of the daily diet may influence the skin, the hair, the nails, the complexion, the physique, and various other aspects of physical and mental beauty.

Your Complexion

A naturally clear, smooth skin, with good color and gloss on a bland surface, is an almost infallible sign of good health in its possessor. Such an attractive skin is a reflection of the physical condition, and to some extent of the mental condition, of the favored individual. It needs no artifices to improve or maintain its natural beauty and charm. Such a skin is, unfortunately, rare but it is attainable by most normal persons.

Consider for a moment this interesting organ, the human skin. This cutaneous surface is comprised of tiny cells which have hardened, or cornified, and which are laid shingle-like on the surface. These tiny cells are mildly acid and must be maintained in that condition for best results. There is, in fact, a mild acid mantle over the skin, which serves to protect it and lubricate it.

Upon the skin surface empty little ducts, or pores, which carry the secretions of the sweat glands and the sebaceous glands, the former distributed over practically the entire surface, and the latter at the hair follicles. The sweat glands pour out acid, along with other liquids and substances, while the sebaceous glands give

off oils. Both acid and oil in proper amounts are necessary to a good complexion.

The skin cells, like all human cells, are regulated and nourished from within the body, although they may be affected by external influences, such as bacteria (germs) and fungi, by dust and dirt, and by irritations and injuries.

When the body as a whole is improperly nourished the skin is usually one of the first organs to display the signs of the deficiency. Among the symptoms of malnutrition are rough and dry skin, eruptions of various types, cracks and wrinkles, and pallor of the countenance. These unpleasant conditions occur most often when certain vitamins are lacking in the daily fare, although a paleness may be due to anemia caused by lack of iron in the diet.

If, for example, vitamin A is inadequate, one of the early symptoms is the appearance of a papular eruption on the arms and thighs, which soon spreads to the legs, abdomen, back, and neck. It resembles acne somewhat but does not contain pus, and in the milder forms often is thought to be the so-called goose pimples.

In the disease, pellagra, due to insufficiency of the vitamin, niacin, and other vitamins of the B complex, more severe skin troubles always develop. These conditions, beginning on the hands and feet, look like a severe sunburn, and are followed by the formation of vesicles and cracking of the skin.

When riboflavin, or vitamin B_2, is deficient in the diet, cracks appear at the corners of the mouth and on the lips. This condition, known as cheilosis, is accompanied by an inflammation of the skin, or dermatitis, which affects the nose, chin, cheeks, and forehead.

These symptoms are, of course, only part of the complete picture of the dietary deficiency states, which are medically diagnosed by many other signs, including

changes in the eyes, the tongue, and various other parts of the body. The conditions described are, furthermore, extreme cases which do not occur in persons who partake of a reasonably good diet.

Many instances of skin troubles may, however, be caused by poor nutrition, and these may be corrected by a proper combination of nourishing foods. No single food possesses any miraculous powers to promote a good complexion, nor is there actually any such thing as a so-called "skin food," whether taken internally or applied to the exterior. The skin does not eat, nor does it absorb substances smeared upon it. The nourishment of the skin comes from within, through the usual medium of the blood stream.

Aside from a good diet, high in vitamins and other necessary nutrients, the skin benefits from proper cleanliness. Regular ablutions of the normal skin are desirable, but there are proper ways to go about it. Removal of dust, dirt, grime, and other foreign substances is beneficial, but too frequent washing of the skin and too vigorous scrubbing of it takes away the natural oils and acids.

After the face or any other part of the skin is washed with soap and water the surface becomes alkaline for a period, but it quickly regains its normal acidity. Modern toilet soaps are usually neutral, containing only a trace of free alkali, the precise content being regulated by law. Such soaps are perfectly safe to use.

Cleansing of the skin may also be accomplished successfully with face creams, such as the cold creams which generally have a base of petrolatum, or mineral oils, with suitable emollients and perfumes. These are efficient and refreshing for the purpose, and are quite harmless to the normal skin. The same may be said for the vanishing and massage creams. A few persons are, however, allergic or sensitive to some face creams and

powders.

Cosmetics have been employed from time immemorial to embellish the human countenance. The ladies of the neolithic caves probably lacquered their dark faces, as the heathen, and some others, do today. The ancient Egyptians developed the art of cosmetics and were addicted to the perfumes of Araby and the dulcet powders of Karnak and Thebes. In the tomb of King Tutankhamen, who ruled 2,500 or more years ago, were found unguent vases of alabaster, around some of which still lingered the delicate fragrance of aromatics. Cleopatra, queen of Egypt, commissioned a Greek physician named Archigenes to write a learned treatise on cosmetics, and the Roman poet, Ovid, was another eminent author who wrote a text on dyes, perfumes, and pomades.

The cosmetics industry in the United States is now a billion-dollar business. Since 1938 it has been subjected to rigid control by law, both federal and state, particularly under the terms of the Federal Food, Drug, and Cosmetic Act. In the application of this law particular attention is paid to the purity, safety, and proper labeling of the products, which consist of a bewildering array of face powders, compact powders, rouges, creams, lipsticks, dyes, pigments, tonics, wrinkle removers, bleaches, depilatories, and other real or alleged beautifying devices.

None of these artifices is indispensable to the healthy, well-nourished individual, but she may derive some pleasure, satisfaction, and possible advantage from a reasonable, moderate, and sensible use of some or several of them. If they are employed immoderately, they can do more harm than good.

Too lavish a use of powders and enamels, for instance, blocks the pores of the skin, causing a slight rise in the surface temperature and some dilation of the superficial blood capillaries. Repetition of the process may

irritate the skin and make it more susceptible to skin troubles.

One important precaution should be observed by the individual who succumbs to the lure of the cosmetic jar, or who revels in it. At least once a day every trace of the powder, grease, or enamel should be carefully removed and the skin cleansed and permitted to breathe naturally, the word "breathe" being used somewhat allegorically. If war paint must be employed, it can be used to greater advantage if changed regularly. Some people clog their pores for days or even weeks, which does them no good.

Among the legion of cosmetics are the wrinkle removers and the alleged freckle removers. The former, which may contain harmless astringents or less harmless fillers, may or may not prove successful. Sometimes the result of their use is not less but more wrinkles. One of the insidious effects of launching upon a too enthusiastic cosmetic career is its cumulative influence, which makes necessary more and more dependence upon these artificial methods. To save face, the addict must continue indefinitely, with increasing reliance upon devices which are no real substitute for Nature.

Freckles are of two types, the kind that come in the summer and disappear in the fall, and the kind that just come and stay. They are caused by pigmentation of the skin and can not be eradicated without causing some injury to the skin itself. While there are methods for removing them, which are successful in some people, the best thing to do about freckles is to let them be, and admire them.

The Control of Acne

Many persons, particularly adolescent youths, are plagued by the skin disease known as acne vulgaris, or

pimples. This condition occurs most frequently about the time of puberty when changes in the glands of the body cause the skin to become more oily and more susceptible to the invasion of bacteria. It is a natural and normal occurrence and nothing to be ashamed of, although it is unpleasant and often is unsightly.

When certain foods are taken to excess they seem to promote acne. Thus, chocolate, which is high in fat, sweets, and fried foods apparently contribute oils to the body. Certain other foods seem to have a beneficial effect on the condition, especially those foods rich in the vitamins of the B group, such as yeast, liver, kidney, whole grain cereals, enriched or whole wheat bread, legumes such as dried beans and peas, and meats, especially pork and pork products.

The most effective treatment for acne is vigorous scrubbing of the affected skin with hot water and a neutral soap. This drastic procedure, along with a proper diet, abstinence from sweets, plenty of outdoor exercise in the fresh air and sunlight, and sufficient rest, will often do wonders for the adolescent pimples of boys and girls.

Your Hair

Your hair is not a detached thing, like blades of grass in a lawn, but is a part of the skin itself. It is comprised mainly of a protein known as keratin, and it is nourished by the same substances that nourish the skin.

The kind of hair that you have, its color, its thickness, and its curliness or straightness, depends mainly upon heredity, but these characteristics can be influenced to some degree by the nutrition of the entire body.

The color of the hair is dependent upon pigment granules, called melanin, which are fixed in the hair as it is formed. These pigments gradually fade as we grow

older, but there is much variation in the time when this fading occurs. Some people are gray, or white-haired, comparatively early in life, while others keep their black, brown, blonde, or red hair until they are three score and ten, or at least until rather late in life.

Graying of the hair can be prevented by the right diet in laboratory animals, but not much can be done about it in the human animal. If black rats are deprived of one or two vitamins, their fur will turn gray; when the vitamins are restored to the rodents' meals, the graying process is reversed.

The vitamins which accomplish these spectacular results, in animals, are two members of the vitamin B group, named pantothenic acid and para-aminobenzoic acid. Several years ago much was written in the public press and elsewhere about the alleged potentialities of these two nutrients in preventing gray hair, but much that was written was, unfortunately, exaggerated.

The richest food source of these vitamins is that old standby, liver, but dried brewer's yeast, egg, peanuts, meats, whole grain cereals, and milk are also good sources of them. It is possible, but not probable, that liberal amounts of these foods in the diet might have some delaying effect on gray hair.

"The hoary head," says the Bible (Proverbs XVI, 31), "is a crown of glory." The best thing to do about gray hair is to accept the inevitable and do nothing about it, except to admire it.

The stalks forming the hair emerge from little pouches in the skin known as the hair follicles. Into each the sebaceous glands contribute oil, which conditions but does not feed the hair. The sweat glands probably also contribute something to it. The individual hairs do not grow continuously but in fits and starts, with rest periods between. Contrary to an old-fashioned belief, long hair does not draw strength from the

body.

Despite a vast amount of effort, man has not yet contrived anything that will make the hair more luxurious. The hair and the scalp on which it grows may, however, be improved somewhat by proper attention, through cleanliness, massage, and the brushing of the hair itself. An occasional shampoo with a liquid soap of high concentration having good lathering properties is desirable for hygienic, esthetic, and stimulating purposes. Regular, vigorous brushing of the hair with a clean brush also helps to keep it clean, and stimulates the scalp.

No diet will prevent or cure senile baldness, or the loss of the hair which occurs to so many men as the years advance. The condition is extremely rare in women. The only way a man could prevent this type of baldness would have been to select a different grandfather, because the loss of hair is usually a familial or hereditary trait. Since this method is obviously impossible, there is not much that can be done to avoid the final result, although the nudity of the scalp can sometimes be postponed or deferred by proper action.

Keeping the scalp clean and free from dandruff, daily brushing of the hair, going without a hat, or wearing a light hat with plenty of ventilation, exposure to an abundance of fresh air and sunshine without burning, and an all-around good daily diet are some of the measures which may help to postpone baldness.

Alopecia prematura, or temporary baldness in youth, may be due to a defective diet or to various other causes, such as arsenical or thallium poisoning. Hair may fall out after a severe fever or after an infection with syphilis, but it usually grows back again. Loss of hair often occurs in cases of severe anemia and in general malnutrition, which can be corrected with proper diet.

Extreme fright may sometimes cause a temporary loss

of hair, as well as a change in the color of the hair. Glandular disturbances may likewise result in hair loss, and these can often be alleviated by medical treatment. Injections of glandular preparations to prevent or cure general baldness have had indifferent success.

Hair tonics, so-called, are as numerous on the market as laxatives. The best that can be said for most of them is that they are harmless, and that the massage which is necessary with their use has some benefit. A few of these preparations contain chemicals such as mercury, which is dangerous, and most of them contain alcohol, which may be bad for a very dry scalp.

"There is nothing more contemptible," wrote Martial, the Roman philosopher, "than a bald man who pretends to have hair."

Your Nails

Your nails, like your hair, are a part of the skin. They are comprised of the same protein, keratin, which has cornified or hardened. Because they are hard, many people think that the nails are bony structures and that they need the mineral, calcium, which is not true. The nails may, however, be affected by the nature of the daily diet.

Healthy nails are a delicate pink in color, are smooth, clear, and shiny, and are resilient without being too dry. In advancing age they change color, becoming yellow, gray, or brown, and they also become more brittle. A few persons are, incidentally, born with brittle nails.

Since the nails are attached to and are part of the body, they often reflect bodily conditions. Changes in the nails occur in such diseases as diabetes, arthritis, high blood pressure, syphilis, infections, anemia, and vitamin deficiencies. There is also a ringworm disease of the nails, caused by the invasion of a fungus, which must

be treated by a physician. This malady is called onychomycosis.

In cases of nutritional anemia, due to lack of iron in the diet, the nails often develop a spoon-like appearance. They are dry, brittle, and deeply lined, with the free end turned up like a spoon. When the anemia is overcome the nails resume a healthy condition.

If vitamins are lacking in the diet the nails are usually dry and lustreless, with more than the normal lines, or striations, both up and down, and sometimes across. Occasional white spots on the nails may or may not have any significance.

The nails grow, on the average, about 1/32 of an inch a week. They should be pared when they get long, and should be kept scrupulously clean at all times. They should not be employed to scratch or pick the skin, since this practice may cause irritations and infections. Ingrown nails on the toes are, incidentally, almost always caused by tight and ill-fitting shoes.

Modern women seem to take a delight in painting their nails in bright hues of crimson, scarlet, and incarnadine, which may or may not enhance their beauty, depending upon the point of view. Most of these polishes and paints are harmless, but a few persons are allergic to some of them.

If you keep yourself healthy and well-nourished, you will generally have healthy, handsome nails.

Your Physique

A well-proportioned form, erect and stately, is obviously an asset to physical beauty. Obesity and leanness are not contributors to comeliness, nor is a bad posture an aid to attractiveness.

The height of an individual is governed by a number of factors, of which heredity is the most important. If

a person is destined to be five feet tall or six feet tall, normal growth will cease at about that height, although the body will fill out. It is possible to stunt growth through malnutrition and other causes, but it is not possible to increase normal or natural height by means of any special diet, or by any one food.

It is true, however, that over the course of a generation the average heights of a well-fed population will increase. Investigations show that modern American college students are, on the average, an inch or two taller than were the students of half a century or so ago. Similarly, Orientals who are naturally small increase in average size after living a generation or so in the United States. This notable increase in height can be attributed to a general improvement in the mode of life, with diet playing a leading role. An abundant American diet, rich in protective foods, is more conducive to good physique in the long run than is the customary Oriental diet of polished rice, other carbohydrates, and little else.

The proportions of our bodies, including height, length of the limbs, size of bones, and distribution of curves, are more or less bequeathed to us by a long line of ancestors, but many of these proportions can be altered, developed and improved by means of proper nutrition, exercise, and some other means.

Muscular exercise produces strength in the muscles thus used, but great strength by itself is not a sign of perfect health. A person with bulging muscles can be malnourished, and such a person may suffer from various afflictions, although of course the reverse is also true. Exercise, adapted to the individual, is a most valuable thing but it is only one of the many factors in good health.

The well-fed person whose weight is ideal is more likely to have good posture and a graceful carriage than is the malnourished or asthenic person, or the overnour-

ished or obese person. Good posture means standing with head erect, chin in, chest out, stomach in, and hips flat. It means walking gracefully, the body upright and erect, and the breathing natural.

A good posture aids proper nutrition because it helps to keep the intestinal and other organs in their natural and proper positions. The individual who sags in the middle, as so many do, cramps his stomach, his lungs, and other vital organs. This unfortunate sag must be especially guarded against after the onset of middle age, when there is more of a tendency for the body to wilt a bit.

QUESTIONS

1. Which of the following nutrients have been shown to have a definite effect in helping to build sound, strong teeth:

Iron	.....
Vitamin A	.....
Salt	.....
Vitamin C	.....
Calcium	.....
Copper	.....
Vitamin D	.....
Phosphorus	.....
Inositol	.....
Fluorine	.....

Answers on pages 189-193.

2. How many deciduous teeth does a normal child have at the end of two and a half years; 6 ....., 12 ....., 15 ....., 20 .....? *See page* 189.

3. How many permanent teeth are there: 12 ....., 20 ....., 24 ....., 32 ....., 36 .....? *See page* 189.

4. Why is it that a clean tooth sometimes decays? *See page* 186.

5. List below the vitamins which have an influence on the health of your skin:

.....
.....
.....
.....

Answers on page 197.

6. Will any known vitamin or other nutrient prevent or cure baldness or avert the graying of the hair? Why? *See page* 202.

7. As part of your body your nails usually require which of these substances for a salubrious condition:

Protein	.....
Calcium	.....
Iron	.....
Vitamins	.....
Starch	.....

Answers on page 204.

8. Is it true or false that the nature of your diet can change, alter, or affect your normal (*a*) height ....., (*b*) weight ....., (*c*) physique ....., (*d*) posture ....., (*e*) personal beauty .....? *Answers on page* 206.

CHAPTER 15

When Your Child Won't Eat

A NORMAL, HEALTHY CHILD who has been properly trained from birth to enjoy his meals will usually eat most of the foods set before him. Once in a while he may rebel at a strange food or refuse some particular dish, but if no one forces him to eat it, or pays any attention whatever to this whim, the chances are that he will consume the food the next time it is served to him.

If such a child suddenly displays a complete lack of appetite, refusing to eat much of anything, it is probable that he is coming down with a disease such as a cold or some other contagion, in which lack of appetite is generally a symptom. Or, it may be that the child has had a distressing emotional experience, possibly a severe conflict with an adult or with another child or group of children. Or, it might be that he is overtired. When he recovers from whatever is ailing him, he will eat satisfactorily again.

Anorexia, or lack of appetite, is nevertheless a widespread malady among children. It is estimated, in fact, that about 50 per cent of all youngsters cause great distress to their fond parents because they refuse to eat the foods which those parents think they ought to eat. Doctor's offices are filled with frantic mothers whose offspring suffer from, or perhaps enjoy, this particular ailment. Homes are often scenes of strife and strain, to put it mildly, when the children refuse to eat their

spinach or something else which is supposed to be highly beneficial.

The one thing that does not help this situation is excitement about it. No child ever died from going on a hunger strike. No child ever wasted away because he developed an aversion to dried prunes or orange juice or something else. Nor does his scorn for certain foods necessarily mean that the child is abnormal or subnormal.

Most instances of perverted appetites in children are not so much the fault of the child as they are of the parent. If no physical cause, such as disease or allergy, is responsible for the condition, it is generally due either to poor training in the early period of life, or else to the wrong psychological approach to this problem of eating.

Training Your Child to Eat

Training the child to eat properly begins on the day that he is born. Nature, taking no risks, provided the newborn infant with the ability to suckle its food. The sensation is pleasant, and the food itself is enjoyable. Learning to eat is, therefore, a simple matter for the normal child who is given the right opportunity.

If the infant has unpleasant experiences, as for example when his milk supply does not flow easily and abundantly, whether from the maternal breast or from the bottle, his normal routine is upset. If the food is too hot or too cold, or too thick, or something else is the matter with it, he will not like it and will begin to develop peculiarities in eating, even at that tender age.

Whether breast fed or artificially fed, babies are given supplementary foods early in life. After the second week they must have cod-liver oil or its equivalent, to provide them with vitamins A and D, and orange juice or its

equivalent to give them vitamin C. By the third or fourth month egg yolk, cooked and mashed, is added to the infant's diet to furnish iron and other valuable nutrients, and by the sixth month or so he is getting easily digested cereals, such as farina, and baked or mashed potato, with a little butter and salt on it.

The normal baby takes readily to these supplements. By the time he is a year old he is eating a variety of nourishing foods, including strained vegetables and fruits, breads, and some meats. He is drinking from a cup, and he is about ready to sit up and feed himself. This is the time to give him foods that he likes and let him go to it, no matter how sloppy the process may be. For a considerable period this self-feeding is certain to be messy, but that does no harm, and continuous practice will teach the child how to hold his own little spoon so that food will not be spilled. If he does spill some, he should not be scolded or chided, and by no means should he be hurried. Mother and child should both be patient.

Eating should always be pleasant, even with young babies. When the child first begins to eat by himself, it is best to let him feed himself while he is hungry and eager to get sustenance. During the latter half of the meal the mother may assist him to finish it. While the child is eating the mother should give him some attention, and not neglect him, but oversolicitude merely spoils him.

As the child becomes a little older, he may wish to eat with the family. Whether he should do so or not depends upon the circumstances in the home, the regularity of the meals, their length, and the conduct of the family itself. A young child should not be forced to sit through a long meal, nor should he be given adult foods from the table. He may be happier if he eats separately, with only occasional visits to the big board.

When and if the child does eat with the family, the meal should always be a placid one, free from argument and strife. No unfavorable comments about the food should be bandied about, and there should be no display of bad eating habits by the parents or older brothers and sisters. Young children are great imitators who learn by example rather than by precept.

Another point to remember about feeding children is that small portions appeal to them. If they are still hungry after they have finished what is on their own plates, second helpings may be given. A formidable meal set before a child may frighten him into a hunger strike.

Food Likes and Dislikes

Throughout the period of childhood, pure milk in some form is the foundation of a good diet. By the age of two, however, the child can consume a wide variety of nourishing foods, although some special preparation may still be necessary.

Most children prefer simple foods and those which are attractively prepared and served. New foods are often regarded with suspicion, although once tried the taste may appeal. Children also like foods served separately rather than combined. They generally prefer them lukewarm.

For no apparent reason at all, or for some trivial reason, children sometimes take a violent dislike to a food and refuse to eat it. Nothing is to be gained by trying to force the undesired food upon the child. The best procedure is to replace it with something else that gives sufficient nourishment, and later come back to it, without comment. By then the original whim may have passed or been forgotten.

Some foods do, of course, definitely disagree with certain children, possibly because of an allergy, or sensi-

tivity, to them or for some other reason. Some children do not like strong flavored foods, like onions or cabbage, while others learn to eat them without difficulty. As a rule, it is best to serve only one highly flavored food at the child's meal, and not several of them together.

Crisp foods usually have more appeal to children than do greasy and sticky ones. They like crisp bacon, toast, baked potato, which they can pick up with their fingers. When very young they should be permitted to eat in this way, regardless of any ideas of etiquette the parents may have. That can come later. Fingers were used for eating long before forks and spoons were invented.

The problem of sweets for children is one that usually arises during the preschool period. As a general rule, the tiny toddler should not be permitted to have candy between meals, but he may be given reasonable amounts of certain sweets in the form of desserts. Suitable for this purpose are pure ice cream, jellies, jams, plain cake and cookies. Small amounts of sugar may be added to puddings and other desserts, but the quantity should be kept small.

Some children are much heartier eaters than are others. The child with a small appetite may, nevertheless, be healthy and well-nourished. If his growth is good and the child is well, the parent need not be unduly concerned by the fact that the child does not consume a tremendous amount of food. On the other hand, if the child is definitely emaciated, constantly tired, and nervous, it is best to consult the family physician or pediatrician.

Occasional or regular feedings between meals may benefit some children, especially if they are not hearty eaters at meal time. A midmorning or midafternoon glass of milk or fruit juice, or a sandwich or cooky or two may give them needed calories and added nourishment.

The Psychology of Child Feeding

Most cases of anorexia in children have a psychological basis. The hunger strike, or refusal to eat, is often predicated on the fact that it will cause acute excitement in the household. Children enjoy being the center of attention, and like to be the heroes in little dramas. If they can turn those dramas into tragedies, for the parents, the greater is their triumph.

If the little hopeful's refusal to eat obviously upsets mother and brings stern admonitions from father, with a few comments and head shakings from grandmother, the child has become the center, the focus of attention, the star on the stage of the home. Perhaps not much attention was being paid to him until he took this method to get it.

If his refusal to eat does not seem to bother anyone at all, but the unconsumed food is removed without comment, and he is sent to bed, there is no profit in making a scene about it. Eating what is set before one should be the natural thing to do, without expectation of any reward for doing it, or any extreme excitement on anyone's part if the child doesn't happen to care to eat that particular food.

A favorite trick of some badly brought up and spoiled children is to vomit, or regurgitate, what has been eaten. This action causes great emotion in some parents, but it is no more harmful to the child than is the equally innocuous habit of holding the breath, which drives some parents to distraction. The remedy in either case is to ignore the episode.

A strong will in a child is, on the whole, a good thing but no child should be permitted to run the family. In many instances children are household tyrants, getting what they want merely by going into a tantrum, vomiting, or by other actions which scare deluded parents

If these theatrics by the child are disregarded by the parent, they cease to have value and will be discontinued.

It is not always the child who puts on the act, however, since the child is often willing and eager to eat, but things are made so disagreeable for him that he can not do so. If one parent nags the other in front of the child, or if domestic battles occur at meal time, the child may lose his appetite through no fault of his own. Unreasonable demands upon the child may also affect his ability to eat. After all, he is a delicate, sensitive mechanism, which deserves careful treatment and a certain amount of reasonable affection.

Eating, which should be a pleasurable sensation, becomes distasteful when it is forced upon an individual. Thus, a child who is commanded to eat a food and is browbeaten and threatened will revolt against it. Nothing whatever is gained by a parent who coerces a child into eating something which he is determined not to eat.

Children, like many adults, often have a negative attitude about certain things. If they are compelled to do something, they usually rebel against it. Conversely, if they are told that a food is not good for them, or that it is too expensive to get for them, they are likely to want it. Parents can sometimes put such subtle measures to good use, without necessarily being cheats.

Many devices may be employed to make eating interesting for a child. If the youngster balks at drinking his milk from an ordinary glass or cup, he may be willing to take it through a straw or a hollow macaroni stick, or in a tea cup or in a glass with a picture pasted on the bottom. He may refuse plain milk, but will eagerly imbibe malted milk, or chocolate milk, especially if he is allowed to mix it himself.

Foods which are refused per se may sometimes be

incorporated in cooked dishes which are then eaten with relish. Eggs can often be disguised in this way. The quart of milk a day which is desirable for all growing children need not be given entirely as a beverage, but some of it may well be included in prepared dishes. The child obtains the same nourishment in this way.

Instinct seems to play a significant part in the choice of foods by young children. If left entirely to themselves to choose the foods they want from a wide variety of victuals, the majority will select those which give adequate nourishment. Several years ago this system was actually tried out in a children's institution, under medical supervision, to see what would happen. Most of the children picked the right foods, but a few went on dietary sprees. If selection of foods is left to instinct, the foods offered should, therefore, be those that are most conducive to health.

After the age of two a normal, healthy youngster whose digestive system is functioning properly can eat almost anything. There are, however, certain foods which should be taboo. Among them are deep fried foods, condiments and spices, coffee and tea, alcoholic beverages, and foods that are too rough and woody. Coffee should not be given to children until about the age of fifteen. Sweets, as already pointed out, should be restricted and not permitted to replace more nourishing foods in the daily diet.

In the regime of life of the growing child, nutrition is not the only important factor in his development. He needs plenty of rest and recreation, a sanitary environment, and good mental hygiene in the home. He must have sufficient sleep, be kept clean, and be treated with consideration, but not pampered.

The vexatious problem of inducing children to eat is, then, not so difficult to solve if the parent begins

to solve it early in an intelligent manner, if she remains unruffled about it, if she employs a little ingenuity, is patient, and does not try to make too formal a ritual out of what should be a natural process.

If the parent begins erroneously and continues to do the wrong things, the problem will get worse rather than better. Some individuals outgrow the idiosyncracies of childhood; others do not.

QUESTIONS

1. True or false?

a. Training of the child to eat properly begins on the day he is born. ..... *See page* 210.

b. The child should be given a huge dish of foods mixed together willy nilly and expected to eat it. ..... *See page* 212.

c. If the child does not eat certain foods readily, he should be shouted at, forced to eat the food, and punished severely if he does not. ..... *See page* 212.

d. The child should be given all the candy and sweets that he desires at any time of the day..... *See page* 213.

e. Soda pop is just as good for a child as is milk. ..... *See page* 212.

f. Every meal should be a pleasant, placid occasion. ..... *See page* 211.

CHAPTER 16

Food Fads and Follies

QUACKERY AND CHARLATANISM always flourish in a scientific era. It is not strange, therefore, that the fields of nutrition and dietetics should be invaded by numerous faddists, fakirs, and pseudo-scientists.

These food faddists are, in general, of two types. One is the crackpot, who espouses some peculiar and weird system of diet because it is inherent in his nature to be different from sensible people. He is usually a crusader and a reformer, although a misguided one, and he is also generally an anti-vivisectionist, an anti-vaccinationist, and anti-everything else that is believed in by the majority.

The second type of food faddist is the mercenary one, who is in this game for what he can get out of it from a gullible and too often easily deluded public. He manufactures and sells, at a good profit, so-called "natural" and "health" foods; he writes books and gives fervent lectures; and he offers, if he can get away with it, advice on diet for a substantial fee. His advice is usually bad.

Members of the sub-standard healing cults make much of dietary measures, because they have very little else to go upon. They, too, usually have peculiar ideas on the subject. Much of what they say sounds plausible to the person unfamiliar with the real science of nutrition, but much that they say is erroneous.

In order to avoid the baleful influence of these various

fakirs it is, of course, necessary to be able to recognize the different fads and faddists. Here, then, is some information on the subject which may be helpful.

The Vegetarian Fad

The rabid vegetarian refrains from eating meat either because he is unduly sentimental and emotional about the killing of domestic animals, or because he has been told and he believes the fallacious notion that meat is a dangerous poison which introduces harmful germs and produces toxins in the body.

A considerable group of persons are vegetarians, however, for religious reasons. One of the tenets of the Seventh Day Adventists is to abstain from meat, but the adherents of this sect are wise enough to use other animal foods, such as eggs and milk.

It is possible to be reasonably well-fed on a lacto-vegetarian diet built around milk, cheese, eggs, and vegetables, but it is very difficult to obtain sufficient nourishment from vegetables alone, or from such plant foods as cereals, nuts, fruits, and vegetables. With only a few exceptions, such as the excellent soybean, these plant foods do not contain the complete proteins which are required for good growth and the proper repair of body tissues. For that purpose they must be supplemented with the proteins of higher biological value from milk, cheese, eggs, and meats.

Aside from the fact that the vegetarian loses a great deal of real pleasure by giving up meat, the reasons for his abstinence are invalid. Properly cooked meats do not implant germs in the body or produce toxins in it. Meat is easily digested by the normal person, and it is undeniably nourishing.

The human intestinal system, furthermore, is not adapted to a purely vegetarian diet. Man is omni-

vorous. His health is best promoted by a mixed diet of both animal and vegetable foods which give him sufficient calories in usable form, provide him with bulk, and furnish an abundance of all the necessary nutrients. Only part of these can be procured solely from vegetables.

Numerous scientific investigations have demonstrated the value of meat in the diet. One of the most interesting of these was a study conducted several years ago under the auspices of the Medical Research Council of Great Britain on the effects of meat on the health and physique of two African tribes. The investigation was undertaken by Dr. J. L. Gilks and Sir John Boyd Orr, who later became the director of the Food and Agriculture Organization of the United Nations.

One of these tribes in Kenya, known as the Masai, lives almost exclusively on milk, meat, and blood, while the other neighboring tribe, picturesquely called the Akikuyu, subsists wholly on cereals and vegetables. As a result of these diets the full-grown Masai man averages five inches taller and twenty-three pounds heavier than the vegetarian Akikuyu. Not only that, but the milk and meat-fed native possessed 50 per cent greater muscular strength than his puny cousin. The women of the two tribes showed similar differences in stature and strength.

Equally significant was the better health of the milk and meat-fed tribe. Among the vegetarian Akikuyu defects of bones and teeth, anemia, lung troubles, tropical ulcers and other diseases were much more prevalent than among the big Masai. Since the environment and heredity of the two tribes were the same, it was the diet which made the difference.

The arguments in favor of vegetarianism are also refuted by the experiences of other races, such as the Eskimos of the frozen North. From the time of wean-

ing until he dies the Eskimo in his native environment lives almost entirely on a meat diet, which is virtually all that he can get. He consumes the whole animal, usually the seal, including the organs which are rich in vitamins. Medical investigations show that the Eskimo does not suffer to any extent from kidney disease or the other evils which are alleged to follow such a unique diet.

The Arctic explorer, Dr. Vilhjalmar Stefansson, lived for several years in the frozen wastes on a meat diet. On his return to so-called civilization he submitted for a year or more to a scientific test, in which he and a companion ate nothing but meat. Frequent examinations revealed that the two subjects remained healthy with no increase in blood pressure, kidney involvement, or other troubles.

Authorities on nutrition are in general agreement with the statement of the late Dr. Logan Clendening that, "warnings against the eating of meat are not only absurd, but positively harmful."

The Refined Foods Fad

One of the great obsessions of the food faddist is the so-called "refined" food, meaning such staple products as white flour and bread, white rice, pure sugar, and various other processed foods. Not only does the faddist inveigh against these common dietary articles, but he alleges, falsely, that their use will cause cancer and numerous other ills.

There is no scientific evidence as yet that diet plays a significant part in the production of the wild growth of cells which cause the malignant tumors known as cancers. Overeating, the consumption of very hot foods, and the constant use of unduly rough foods may contribute to cancers of the stomach, but the type of food

caten in an ordinary mixed diet does not influence these growths in other parts of the human body, so far as is known today.*

As to the refined foods themselves, it is quite true that highly milled grains and cereals, such as wheat, rye, rice, and corn, are less nutritious than the whole grain products. The milling process removes the outer layers and the germ, which are rich in desirable vitamins and minerals. Even so, these staple products furnish valuable food-energy, fairly good proteins, and small amounts of vitamins and minerals. If they are included in reasonable quantities in an all-around good diet which provides all necessary nutrients, they are useful, economical, and harmless.

The arguments against white flour and bread were, furthermore, knocked into a cocked hat by the adoption in 1940 and 1941 of the flour and bread enrichment program. In accordance with standards set by the federal government, flour and bread were enriched with the vitamins, thiamine, riboflavin, and niacin, and with the food-mineral, iron, and could also be enriched at the option of the manufacturer with calcium and vitamin D. During World War II this enrichment was made compulsory, but the order was revoked in 1946, although about half the states now have laws making such enrichment mandatory.

Even before the enrichment program, most bakers used from 2 to 4 per cent milk solids in making their white breads, a procedure which added valuable protein, calcium, and riboflavin to the loaf. They are continuing to use this system, except for the French and Vienna types of bread.

* Under controlled conditions with animals, tumors can be caused to develop in susceptible animals by certain dietary measures. Thus, liver tumors have been produced in rats by chronic choline deficiency.

Enriched bread made with milk is virtually the equivalent in food value to 100 per cent whole wheat bread, which most people will not eat. The enriched white bread is more easiy digestible, is more completely assimilated, and is much more tasty and palatable for the average person.

Standards for the enrichment of corn and corn products were promulgated by the Federal Food and Drug Administration in 1947, and corn meal is required to be enriched by law in a few states. Since this type of enrichment will sound the death knell of the dietary deficiency disease, pellagra, the requirement should be universal. Macaroni and spaghetti are now also enriched. Sensible consumers will demand only the enriched products.

New methods for producing and converting rice have also been developed, so that a fluffier white rice is obtained, which retains about 80 per cent of the precious vitamins and minerals of the natural brown rice. Ordinary white rice should no longer be consumed by any wise consumer, since the polished rice is almost entirely pure starch with hardly any vitamins or minerals.

Strictly moderate amounts of pure white sugar do no harm in the diet, although brown sugar, honey, and molasses are much more nutritious sweetening agents. Refined sugar is a pure carbohydrate, devoid of protein, vitamins, and minerals. Its principal advantage in the daily fare is as a source of food-energy and as a substance which adds flavour to other foods and makes them more attractive. More is said about sugar in Chapter 18 (page 241).

The food faddist often rants against other processed foods, such as pasteurized milk and the canned foods, but these ravings can be dismissed as mere absurdities. Pasteurization is an essential safety measure which has no appreciable effect upon the unsurpassed nutritive

properties of a clean milk supply.

The "Health" Food Fad

The food fakir often promotes and advertises certain foods as "health" foods or as so-called "natural" foods. Actually, there is no such thing as a health food, because no single food is essential for or indispensable to health, except possibly in the case of pure milk for growing infants, and even then substitutions are possible in case of necessity. It is the total diet which helps to promote good health, a condition which likewise depends upon other factors besides diet.

As pointed out by the Council on Foods and Nutrition of the American Medical Association, "The term 'health food' and equivalent claims or statements to the effect that a food gives or assures 'health' are vague, misinformative, and misleading. . . . No one food is essential for health; there are no 'health foods'."

Despite this undeniable fact, numerous small establishments called "health food stores" and "nature's food stores" do a considerable business among those who want such peculiar wares. The goods are mostly packaged products which are sold at a substantial profit. The foods themselves usually are harmless enough, and may even be worth while in the diet, but the claims made for them are often highly colored and exaggerated.

The Food Combination Fad

Many food fads come and go. Some strange system of diet will hold the center of the stage for a while, gain a considerable number of deluded adherents or disciples, and then pass out of the picture. Its followers take up something else.

One of the fads which attained quite a vogue a few years ago was the ridiculous idea that proteins and

starches should not be consumed at the same meal, or even mixed in the diet. A few persons still cling to this notion, but this fad, called "the Hay diet" after its originator, is now passé.

That there was no sense whatever to this fad is proven by the fact that Mother Nature knew better, because she deliberately mixed proteins and starches or other carbohydrates in many of our common foods. Thus, wheat is about 72 per cent carbohydrate, mostly starch, and about 13 per cent protein. Potato, widely recognized as a starchy food, also contains some protein, although only about 2 per cent. Fresh whole milk, our best food, has about 5 per cent carbohydrate and 3.5 per cent protein. Vegetables have from 1 to about 7 per cent protein along with their starches and other carbohydrates.

Normal persons have been eating meat and potatoes, crackers and cheese, ice cream and cake, and numerous other combinations of proteins and starches for many centuries without the slightest detriment to their health. It is, in fact, virtually impossible to concoct a meal that does not contain both starch and protein, and there is no scientific reason whatever for not combining or mixing the two.

Nor is there any basis for the belief held by many persons that certain food combinations are dangerous and undesirable. Thus, some persons think that milk should not be consumed with seafoods, forgetting the excellent clam chowders, oyster stews, and lobster stews that are made with milk and are consumed with zest by those who like this harmless and nourishing combination.

If a food agrees with you when eaten separately it will agree with you when eaten in combination with any other food that agrees with you. If you are allergic to a particular food, you will probably still be allergic to

it if it is combined with any other.

Some of these misconceptions about food combinations probably arose in the old days when someone ate a contaminated or spoiled food in combination with another food. The resulting digestive upset was blamed on the combination rather than upon the bacteria or toxins in the one food, which were responsible for the trouble.

The Fasting Fad

A favorite recommendation of some food faddists is a fast of several days or a week, often preceded by a purge. The theory of this self-starvation period is that it permits the body to get rid of or recover from its supposed impurities. This is nonsense, and a fast is more harmful than helpful.

The only time when it is advisable to withhold food for a brief period is during a digestive upset. Letting the stomach and intestines rest for a day or two gives them an opportunity to recuperate from an infection or inflammation. Even then, however, broths, thin soups, toast, and other low-residue foods may be permitted in small amounts in order to maintain the normal motility of the alimentary tract.

Prolonged fasting is undesirable for any normal person. Not only does the intestinal tissue lose its motility and tone by such abuse, but a certain amount of stagnation occurs, with accumulation of mucus and waste products, which are not pushed along to the colon.

The human intestinal system works best when it is constantly supplied, but not oversupplied, with food. Fasting not only deprives the system of necessary bulk, but may also despoil it of vitamins and other necessary nutrients. This fad is an abuse of the body, which

should be shunned by any healthy, sensible person.

The Roughage Fad

Many of the faddist diets are built around copious quantities of indigestible fibre, or roughage. The faddist often makes much, far too much, of bran and psyllium seeds and seaweeds and various other more or less irritating substances.

As has been explained in detail in Chapter 9 on Keeping the Body Regular, a certain amount of roughage, or bulk, is desirable in most daily diets. How much is best for an individual depends upon him, however, and not upon the recipe of a food faddist. What is right for one person may be far too much for another.

Other Food Fads

The word "acidosis" is frequently bandied about by the food faddist. The truth about acidosis and acid conditions has been fully set forth in Chapter 6 of this book, where it has been shown that in the normal person acidosis is a myth.

One of the preposterous claims of the faddists is that acid fruits and starches should not be consumed together, or that milk and acid fruits are incompatible in the diet. Anyone with even a rudimentary knowledge of human physiology will recognize that such statements are as foolish as the nonsense about the alleged incompatibility of proteins and starches.

Shortly after the turn of the century an ardent reformer named Mr. Horace Fletcher urged that all food be chewed for a very long time. Just how long is now forgotten, but there was a count of sixty or a hundred or some such figure. From this Mr. Fletcher progressed to the idea that we should eat only those foods which can be liquefied in the mouth and then only in small

amounts. A considerable number of persons nearly ruined themselves by taking to this fad, which is now obsolete.

Quick methods of drastic reducing by starvation or near-starvation methods are exploited by many food faddists, who often attach fancy names to these dangerous pastimes. Nothing is worse than body depletion, since it generally reduces the victim to a physical and mental wreck. Beware of anyone who stridently and blatantly offers magic or marvels through diet. Proper nutrition can sometimes do wonders, but it can never perform real legerdemain.

The food faddists are, unfortunately, not the only ones who exploit their foods. Some manufacturers and sellers of foods are also guilty of foisting vague, inaccurate, and tricky advertising, in newspapers and magazines and over the radio, on a gullible public. Consumers should be alert to recognize and discount such advertising.

Beware of such phrases attached to food advertising as "scientific food concentrate," "sensational offer," "recommended by doctors," "produces pep and energy," "builds blood and muscle," "induces restful sleep,"; regard with well-merited suspicion such words as "wonderful," "remarkable," "marvelous," "glamorous," "healthful," and other superlatives in food promotion.

Like all advertising, food advertising is written by bright young men known as copywriters who are associated with advertising agencies which are paid to promote various products, whether they deserve it or not. Like all advertising, food advertising should be truthful, and much of it is. Moderate statements based on facts will sell goods of high quality which give satisfaction when bought. Immoderate advertising may sell a product to the unwary, but usually only once.

Reliable Information on Food

Since the outpourings of the food faddists and fakirs are unreliable, unsatisfactory, and occasionally dangerous, the consumer naturally would like to know where and how to obtain reliable and authentic information on diet. There are, fortunately, many excellent sources of such material.

The United States Government issues numerous pamphlets on various aspects of nutrition, child care, and home making. A complete free list of these can be obtained by writing to the Superintendent of Documents, Government Printing Office, Washington 25, D. C. and asking for Price List 11 on Foods and Cooking. Other free price lists are available on health, animal industry, children, and many other subjects.

The desired pamphlet may then be purchased from the Superintendent of Documents for the price stated, usually around ten cents. It may sometimes be obtained free by writing direct to the government bureau which has issued it, such as the Public Health Service, the Children's Bureau, or the Department of Agriculture, all in Washington, D. C.

State and local health departments usually have authoritative literature on foods and nutrition, which is sent without charge to those who ask for it. State departments of agriculture, extension services, and state universities may also have pamphlets on diet, which are free for the asking.

The voluntary health associations and societies, the life insurance companies, and many of the food trade associations offer literature on nutrition which is reliable. The last named do, of course, play up the particular product in which they are specially interested. A dairy council, for example, does not exactly neglect to mention milk and dairy products in glowing terms, and a

baking institute or meat institute gives plenty of prominence to their own products. Even so, however, this literature is generally truthful and based on accepted scientific facts.

Reputable commercial concerns often publish excellent pamphlet material on nutrition, without offensive advertising of their own products.

Articles in the women's magazines of wide circulation are on the whole reliable statements about nutrition and diet, although once in a while some one of them may go haywire. During the vogue of the food fad holding that proteins and starches should not be mixed in the diet, one prominent magazine featured this false system and thereby deluded its trusting readers. The digest and news magazines which are looking for interesting and sensational items are not always to be trusted in the field of nutrition.

There are, of course, innumerable popular books on the subject. If they are written by competent authorities of good reputation they will offer valuable information, free from faddism. A bibliography of a few such technical books is given on page 269. These volumes are usually available in the larger public libraries.

QUESTIONS

1. True or false?

a. A strictly vegetarian diet containing no animal foods whatever is as nourishing as a sensible mixed diet of vegetable and animal foods. ..... *See page* 219.

b. If you want to, you can be adequately nourished on a lacto-vegetarian diet, which includes milk and dairy products and eggs, along with plant foods. ..... *See page* 219.

c. Diet is a most important factor in producing human cancer. ..... *See page* 221.

d. Refined foods should never under any circumstances be eaten by anyone. ..... *See page* 221.

e. There is really no such thing as a "health" food. ..... *See page* 224.

f. It is dangerous to mix proteins and starches in the diet. ..... *See page* 224.

g. If a food agrees with you when eaten by itself, it will agree with you if eaten with any other food that agrees with you. ..... *See page* 225.

h. Fasting is an undesirable procedure for the normal person. ..... *See page* 226.

i. Great faith should be put in the advertising of a company which states that its food product is "a sensational offer of a scientific food concentrate which produces a wonderful feeling of pep." ..... *See page* 228.

CHAPTER 17

Foods of Animal Origin

MAN IS NATURALLY an omnivorous animal whose normal diet properly consists of a variety of foods derived from both animal and vegetable sources. When primitive man lived in a cave in the dim and distant prehistoric past, he subsisted on the grasses and grains, the fruits and nuts, which he found growing wild, but when he became a hunter a little later in his career, he quickly learned to appreciate meat and fish, especially after he discovered fire.

Today our numerous foods of animal origin include milk and its many products, eggs, poultry, meats from numerous animals, and fish and shellfish. Of these, pure milk is most valuable of all foods from the standpoint of human nutrition, with the egg a close second. When, in fact, man made friends with the cow and began to use the lacteal fluid of this great foster mother of the race, he made his first step forward in the art and science of nutrition.

All foods of animal origin, however, possess one common attribute, their excellence in body-building proteins of the highest biological value. In this respect they are superior to most foods of vegetable origin, but in some other dietary respects all except milk may be inferior to certain vegetables and fruits. That is one of the reasons why man thrives best on a sensible mixed diet.

Milk and Dairy Products

For the past twenty years or more pure milk has

been widely and enthusiastically acclaimed as our "most nearly perfect food." To me this phrase is something like the refrain of the popular song which haunts and harasses its composer, because I originated this maxim in 1928. It was the title of a book on milk which I wrote in collaboration with Dr. Samuel J. Crumbine, general director of the American Child Health Association, and one of the pioneers in the public health movement for clean and safe milk supplies in this country. The book itself is long since out of print but the title lingers on. It has been generally accepted because it is true.

In its natural state pure, fresh whole milk is a balanced blend of virtually all of the nutrients required to nourish the human body. Milk and eggs are, in fact, the only foods designed by Nature for the development and nurture of new lives, and they are, therefore, provided with all the elements necessary to that important purpose.

In composition cow's milk usually averages from 3.5 to 4.0 per cent butterfat, although the milk of Jersey and Guernsey cows may be richer. It has about 5 per cent lactose, or milk sugar. It contains about 3.5 per cent complete protein, with every one of the essential amino acids. In addition, milk has all the known vitamins, although in somewhat varying amounts, and it is rich in the food-minerals, calcium and phosphorus, in the best ratio for efficient utilization by the body. Milk gives 20 to 21 calories to the ounce, or about 340 to the pint and 680 to the quart.

As a human food, milk misses dietary perfection only because it is somewhat low in certain of the vitamins, is low in the food-mineral, iron, and has such a high natural water content, averaging about 88 per cent, that it is difficult to consume this indispensable food in adequate quantities for the best nourishment. Milk is

rich in vitamin A and the vitamin of the B group, riboflavin, and is a fair source of thiamine, or vitamin B_1. When fresh it contains an appreciable amount of vitamin C, or ascorbic acid, but much or all of this is lost when milk is processed.

About 80 per cent of all the market milk sold in the United States is pasteurized, and all of it should be. Pasteurization, or the careful heating of every particle of the milk to 143 degrees Fahrenheit for thirty minutes, or the heating of the milk to 160 degrees for fifteen seconds, followed in either case by immediate cooling to 50 degrees or less, puts the final seal of safety on a clean milk supply. This process destroys about 90 per cent of the bacteria in the milk, including any that are pathogenic, or dangerous to health. In past years there have been numerous disastrous outbreaks of diseases due to contaminated raw milks, and occasionally such epidemics occur even today.* While pasteurization reduces the vitamin C, which is not particularly abundant in milk anyway, it has no appreciable effect upon any of the other unsurpassed nutritive qualities of the milk.

Much of our market fluid milk is now homogenized and also contains added vitamin D. Homogenization is a process in which the milk is forced under pressure through fine nozzles, with the result that the fat particles are broken up and spread throughout the milk. The process gives the milk a soft curd, thus making it more easily digested. Evaporated milk, from which about 60 per cent of the water is removed by a heating process, is also homogenized and fortified with vitamin D. Goat's milk is homogenized by Nature. It has somewhat less iron than cow's milk and very little vitamin D, but otherwise has about the same nutritive

* See Tobey, J. A.: *Legal Aspects of Milk Sanitation.* 2d edition. Milk Industry Foundation. New York and Washington, D. C. 1947.

properties.

Authorities on nutrition are agreed that every growing child, every expectant mother and every nursing mother, should have at least a quart of pure milk a day in some form, or its equivalent in other dairy products, and that at least a pint a day is desirable for all normal adults. All of this quantity of milk need not be given in fluid or beverage form, but some of it may well be incorporated in other cooked foods. A few persons are allergic, or unduly sensitive to the proteins of milk and can not take it in any form, but some sensitive individuals can safely consume the evaporated milks, in which the proteins have been altered by the heat treatment.

Skimmed milk is a valuable food. It has only about half the calories of whole milk, but it contains all of the valuable nutrients of the milk except the butterfat and vitamin A. It is, in fact, superior in dietary properties to most other common foods. Powdered skim milks are now on the market in package form and can be used to advantage in cooking and in other ways.

All of the products of milk, including butter, cream, cheese, ice cream, buttermilk, malted milk, acidophilus milk, and whey are most valuable foods. Butter, which is at least 80 per cent fat and yields 208 calories to the ounce by weight, is the best of all food fats. It is rich in vitamin A as well as in food-energy, but it is an expensive food. Margarine, made from vegetable fats, blended with powdered milk, and fortified with 15,000 units of vitamin A to the pound, has virtually the same food value as butter at about half the cost.

Cheese is a concentrated food prepared by coagulating the curd of milk, a pound of cheese representing the casein and fat of a gallon of milk. There are about 400 different kinds of cheese, which can be classified as soft, medium, and hard. A representative hard

cheese, such as American cheddar or "store" cheese, has about 29 per cent protein of high value, and thus is an excellent substitute for meat in the diet. It gives about 125 calories to the ounce and has about nine times as much calcium as whole milk. It is an economical food, too.

Ice cream is the frozen product made from cream, milk and milk products, sugar, flavoring, and a little gelatin or other stabilizer. There is a wide variation in the caloric content and food value of ice cream, depending upon the formula, but a plain vanilla ice cream, with 12 per cent butterfat and 10 per cent nonfat solids will yield 75 calories to the ounce, 200 to the average serving of 2/3 cup (1/6 quart), and about 1,200 to the quart. Such an ice cream contains protein, is rich in vitamin A and calcium, is high in riboflavin, and is easily digested. It is a good food for children and adults.

Eggs and Poultry

The whole egg of the hen consists of the yellow yolk, surrounded by the white, and encased in a white or brown shell about 1/60 of an inch thick. The color of the shell is no indication whatever of the nutritive value of the egg, the brown and the white being equivalent. The average weight of the egg, including the shell, is about two ounces, but some are smaller and some are larger, and all are of the same nutritive value, weight for weight.

Most of the nutriment of the egg is in the yolk, which may vary in color from a rich orange to a pale yellow, but the white contains protein and riboflavin. The yolk is high in protein of top value, rich in vitamin A, good in thiamine and niacin, and unlike milk, it is rich in iron as well as calcium. It does not have any appreciable amount of vitamin C, but contains some vita-

min D. The egg gives about 35 calories to the ounce. It is easily digested, whether raw or cooked in any form.

Egg yolk is generally added to the diets of infants at about the third or fourth month, chiefly to supply necessary iron, but also for its other valuable nutrients. For the growing child an abundance of eggs is desirable, along with pure milk and other protective foods. Eggs are likewise good for adults, but many authorities believe that elderly persons should reduce their consumption of eggs, because of the high content of cholesterol in this food.

In addition to hen's eggs, we also consume duck's eggs, which are somewhat larger, more highly flavored, and richer in fat than hen's eggs, but otherwise have about the same nutritive properties. Other eggs used for human food include those of the goose, the turtle, and the roe of fish such as the sturgeon and shad.

Poultry comprises all of the domestic birds such as chickens, fowl, ducks, geese, turkeys, guinea fowl, and pigeons, which are raised for the table or for egg production. In all of these birds the meat is fine in fibre, is firm, and is not mixed directly with the fat. Chickens and turkeys have much white meat, while ducks and geese are practically all dark meat, with much more fat under the skin. Goose fat is used by some races as a replacement for butter, although it does not have as great a food value.

The meat of poultry is high in protein of excellent merit, ranging from about 16 per cent in ducks to 20 per cent or more in chickens and turkeys. It is likewise an excellent source of the B group of vitamins, but with little vitamin A and hardly any vitamin C. This meat contains about half as much iron as beef. Chicken meat averages about 30 calories to the ounce, turkey about 80, and duck about 100, with variations due to the actual amount of fat in a particular bird.

Meat

Aside from poultry our most common meats are cuts from the muscles and the glandular organs of beef, veal, pork, and mutton or lamb. These are all wholesome and desirable components of the usual diet, since they contribute good nutrition, flavor, and high satiety value to the meal. They are rich in body-building protein, high in B vitamins, and good sources of iron and phosphorus, as well as of useful food-energy. Unlike milk, meat is a poor source of calcium.

The protein of muscle meat, exceeded in biological value only by that of milk, generally averages about 20 per cent, but it may be considerably more in a very lean meat, and considerably less in a very fat meat. This protein is coagulated and rendered more digestible when meat is cooked, a process which also reduces the water and fat, softens the tissues, and has an important sanitary function. All meat should be properly cooked before consumption. Pork and pork products must always be thoroughly cooked (to 137°F) in order to prevent the possibility of infection with the trichina which sometimes are found in raw pork and which are rendered harmless by this heating.

Most nourishing of all meat is liver, which resembles milk and eggs in all-around dietary virtues. It contains all of the vitamins, including even vitamin C, and is rich in protein, but the outstanding characteristic of liver is the abundance of iron found in it. No other food compares to it in this respect, and one ounce of calf's liver will give to the average person one-quarter of his daily iron requirement. It will also give him some calcium. Kidney is another nourishing glandular organ, although a little less so than liver.

Fish and Shellfish

Fish and shellfish are comparable to meat as protein

foods. They contain less iron than most meat, but on the other hand they are rich in another important food-mineral, iodine. Fresh and salt water fish possess the same nutritive properties, except that those from the sea are richer in iodine and usually have a little more iron. Like meat, they are high in phosphorus, but low in calcium, the exception being the canned salmon which has numerous small and edible bones well supplied with this mineral. Canned salmon is also a good source of vitamin D.

The flesh of fish contains the vitamins of the B group, but is practically devoid of vitamin C. The oils of the fish, particularly in the liver, are rich in vitamins A and D, which are extracted for the cod-liver, halibut liver, percomorph, and other fish-liver oils. Some red fish, like the salmon, also show vitamin A in the flesh.

Since fish are buoyed up by the water in which they swim, they do not have as firm a body structure as the land animals, and they will, therefore, spoil and decompose much more quickly. For this reason they should be consumed as fresh as possible, and kept carefully refrigerated. Fish, like meats, are preserved by drying, salting, pickling, smoking, freezing, and canning without appreciable detriment to their nutritive qualities.

The exact food qualities of fish vary with the tremendous number of species, and even within the species at various times of the year. Some fish are, furthermore, quite fat while others are lean. Thus, salmon, tuna, mackerel, shad, and herring are examples of fat fish, while cod, flounder, sole, and haddock are lean fish. Canned salmon and canned tuna yield around 50 calories to the ounce, while a cod steak gives only 22. The protein content of all will average about 20 per cent, with some variation.

The succulent seafoods include the crustaceans such as lobsters, crabs, crayfish, shrimp, and prawns, and the

mollusks or bivalves such as oysters, clams, scallops, and mussels, as well as the single-shelled abalone of the Pacific. All are good protein food, although the oyster has only 10 per cent, about half as much as most of the others. The oyster is, however, high in iron and iodine, and unlike most fish has some calcium. It is the most acid of all foods, but its acid is neutralized when it is eaten in a milk stew.*

* Questions referring to this chapter are given at the end of Chapter 18.

CHAPTER 18

Foods of Vegetable Origin

EVERY PLANT cultivated for food purposes is a vegetable, although in popular usage we make a distinction between fruits and vegetables. It is interesting to note that the word "vegetable" comes from the Latin *vegetabilis*, meaning vigorous or enlivening, while the word "fruit" is from the past participle of the Latin verb meaning to enjoy, *fructus*. These are both relevant descriptions of foods which are essential components of every well-rounded and adequate daily diet.

Among the many parts of edible plants consumed by man are the roots and tubers, the stems and stalks, the buds and seeds, the flowers and fruits, and the berries and leaves. Nuts, which are not included in the list, actually are fruits in hard shells. The grasses and grains from which we obtain cereals, flour, sugar and other products belong, of course, to the vegetable family.

In such a large and versatile group of foods there are, naturally, many differences in nutritive properties, but all vegetables, as the term is commonly used, have certain similar features. They are, in general, good to excellent sources of vitamins and minerals; they have an alkaline reaction in the body; they contain roughage and thus have mild laxative properties; they are all sources of food-energy, although here we find great variations, ranging from the solid, starchy potato to the delicate, watery lettuce leaf.

Most vegetables are low in protein and fat, but there are some noteworthy exceptions to this rule. The

legumes contain valuable proteins, especially when dried, and the nuts are rich in both protein and fat.

The foods of animal origin, such as milk, eggs, meat, and fish, are recognized as superior for body building, but all of these, with the exception of liver, are low or lacking in one essential nutrient. That missing substance is vitamin C, or ascorbic acid, but Nature in her infinite wisdom took care of the matter by providing us with ample supplies of this vitamin in most of the fruits and in some of the vegetables, particularly the green leaves. Here is another one of the reasons for the success of the sensible mixed diet.

Fruits

Fruits were planned by Nature to serve, as a rule, as receptacles for the seeds of the plant, enclosing them in a protective covering. Most of them grow on trees, shrubs, and vines. Many foods which are classed by culinary practice as vegetables, such as the tomato, the pepper, and gourds like the squash, pumpkin, and cucumber, botanically are fruits.

Among the many types of common fruits are the citrus varieties, such as oranges, lemons, limes, and grapefruit; the pome fruits having a hard core, like apples and pears; the drupe fruits with hard seeds, such as peaches and cherries; the melons; the berries; the grapes; and a number of unclassified types, such as bananas, pineapples, olives, avocados and numerous others.

Practically all fruits are rich in vitamin C, but with considerable variation in potency. At the head of the list are the citrus fruits, especially oranges and lemons, but the strawberry is also high in ascorbic acid. One whole orange has in its juice and pulp from 60 to 100 per cent of the daily requirement of vitamin C for the

average adult, the precise amount depending, of course, on the size and variety of the orange.

The best of all food sources of vitamin C is the green pepper, which contains as much ascorbic acid as 34 milligrams to the ounce. It is also rich in vitamin A and the minerals, calcium and iron. This green pepper is not to be confused with another altogether different plant, the *Piper nigrum,* from which we obtain the pepper grains used as a condiment.

The luscious red tomato, which is botanically a fruit, is also an excellent source of vitamin C, although it has only about one-half as much as the average orange. Since this fruit is highly acid in nature it does not lose any appreciable amount of this delicate vitamin when it is canned or converted into tomato juice. The tomato likewise has vitamin A and some of the B vitamins, as well as minerals. It is low in food-energy, giving only about 6 calories to the ounce.

Ascorbic acid is not, however, the only contribution made by fruits to the human diet. In addition to this vitamin, fruits often contain other important nutrients, such as vitamin A in the yellow varieties (apricots, peaches, oranges, etc.), and thiamine and other vitamins of the B group. Most fruits, especially when dried, are high in iron, the best for this purpose being dried apricots, prunes, raisins, figs, and peaches. The cranberry, raised in bogs near the sea, is a good source of iodine, and most fruits have some calcium.

All fruits, except plums, prunes, and cranberries, have an alkaline reaction in the body. True, they are acid in nature, due to the presence of citric, malic, tartaric, and other acids, but during the processes of digestion these are converted or oxidized into base-forming substances, so that the end result is alkaline.

Most fruits are rich in carbohydrates such as sugars and starches. Included among these carbohydrates is a

substance known as pectin, which is especially abundant in apples, crab-apples, currants, grapes, red raspberries, quinces, guaves, plums, and rose hips. This pectin not only aids digestion, but it is what makes the fruits jell, in combination with acids and sugar. Jelly is prepared from the juice of fruit with sugar, while jam is made from the pulp with sugar, and marmalade contains the rind as well as the pulp and sugar.

From the standpoint of human nutrition the ripe banana is an outstanding food, and bananas and milk make an almost perfect food combination. When fully ripe the yellow or red skin of this fruit is flecked with brown spots; when green the banana consists of about 22 per cent of difficultly digestible carbohydrate, but as it ripens this is converted to simpler sugars, which can be easily assimilated, even by small infants. A medium-sized banana offers about 100 calories, or about 28 to the ounce. It contains vitamins C and A, as well as some iron and calcium.

The most fat of all fruits is the avocado, which has about 26 per cent fat, and as a consequence yields 62 calories to the ounce. It does not have quite as much vitamin A as ripe olives, which are about 19 per cent fat, but it contains B vitamins and iron, and it also has about 2 per cent protein. The avocado is also known as the alligator pear, and in California it is called the calavo.

Nuts

As a class nuts contain more fat than any other food of vegetable origin, averaging from 44 to 64 per cent, with the pecan running as high as 73 per cent. For this reason nuts are somewhat difficult to digest, and must be chewed thoroughly or are best taken in the form of ground nuts, such as peanut butter, almond paste, and the like.

Nuts not only are rich in fat but are excellent sources of proteins of good quality. They are abundant givers of food-energy, two Brazil nuts, a dozen medium-sized peanuts, the same number of pecans, and ten filberts each offering about 100 calories. Chestnuts are an exception, having only about one-third as many calories as most other nuts.

Some of the nuts, notably the almond, are excellent sources of iron, and most contain fair amounts of calcium and phosphorus. The English walnut has about half as much iron as the almond.

Although the peanut is used as a nut and looks like one, actually it is not a nut at all, but a legume like the bean, the pea, and the soybean. The peanut is a most nourishing food, rich in the vitamins of the B group, and high in excellent protein, which is a good substitute for that of meat. Peanut butter is a valuable spread for bread, richer in thiamine, niacin, and riboflavin than regular butter, but with much less of precious vitamin A of butter made from milk.

When properly used as adjuncts to the diet rather than as desserts or fillers-in at the end of a meal, nuts are valuable foods which can make a substantial contribution to good nutrition.

Vegetables

More than one hundred different kinds of vegetables are now more or less staple foods in the United States. Of them all the white potato is preeminent because this common root vegetable furnishes an abundance of easily assimilated food-energy at comparatively low cost. One medium-sized potato offers about 100 calories, along with a little protein close under the skin, and small amounts of vitamins and minerals. The potato has only about one-half as much vitamin C as the tomato, which

in turn possesses only about half as much as the orange, but the potato makes a significant contribution of ascorbic acid to our diets because of the quantities eaten.

The sweet potato, which belongs to an altogether different family, is much higher in nutritive value than the white potato. Like all yellow vegetables, it contains a considerable amount of vitamin A, with about the same quantity of vitamin C as the white. Other valuable root vegetables include beets, carrots, turnips, rutabagas, parsnips, onions, salsify, and dasheen or taro. Of these, the carrot is the best, particularly as a course of vitamin A, or its precursor, carotene.

The most nourishing of the vegetables are those which are lowest in food-energy values, the greens. The green leaves of plants such as lettuce, kale, cabbage, spinach, and the like are liberally supplied with vitamin A, vitamin C, and calcium. For this reason they are classed among the protective foods which deserve a copious use in the daily diet.

The tops, or greens, of many of the root vegetables, such as turnip tops, carrot tops, mustard greens, and dandelion greens, are also extremely valuable as foods, although too often they are discarded by ignorant or careless housewives. Turnip greens, for example, contain about one thousand times the vitamin A of the root itself. In rural regions many wild greens may likewise be employed to advantage in the spring when they are young and tender, both in salads and as cooked foods. Among these excellent foods are watercress, cowslip, dock, pokeweed, parsley, milkweed, purslane, lamb's quarters, and fiddlehead greens, some of which are too often regarded merely as common weeds of no value.

The legumes, including the peas, beans of various kinds, lentils, soybeans, and peanuts, are rich in good protein, that of the soybean being as complete as the protein of any animal food. These proteins are obtained

to best advantage from the dried legumes which are cooked, such as beans and peas, which are also good sources of iron and calcium, and fair sources of the B vitamins.

The stem vegetables, or stalks, including asparagus, celery, mushrooms, rhubarb, and various other shoots and sprouts, are tender and palatable, but are generally low in food-energy and in other food values.

Gourds such as pumpkin, squash, chayote, and cucumber are really fruits but are used as vegetables. The yellow squash and pumpkin are both excellent sources of vitamin A, but the winter squash is much better in this respect and in other dietary values than the summer squash. The cucumber has relatively little food value, being about 96 per cent water. The eggplant, which resembles a gourd, is equally low in nutritive properties.

Herbs and spices, of which there is a tremendous diversity, add pleasure and zest to other foods, but contribute little, if any, food value. Those who are interested in this subject will find further useful information in a pamphlet on savory herbs issued by the United States Department of Agriculture, Washington, D. C. as Farmers Bulletin No. 1977.

Grains

Cereal grains always have been, and are, the staple foods of the human race. In the United States wheat and its products, such as bread, furnish more than one-quarter of all the calories in the national dietary, although at considerably less than one-quarter of the cost of all foods. In other parts of the world, particularly the Orient, rice is the most extensively used cereal.

In addition to wheat and rice, other grains widely employed as food include rye, oats, corn or maize,

barley, buckwheat, and millet. The composition and properties of the cereals vary, of course, but all are in general low in moisture and high in carbohydrate, particularly starch. They are, therefore, economical sources of food-energy, but they also contain from 8 to 12 per cent protein, and thus make a real contribution of this body-building substance to the diet. Their proteins are not complete, but they are easily supplemented, particularly by the proteins of milk.

The whole grains are rich in minerals, such as iron and phosphorus, and they are well supplied with the B group of vitamins, especially thiamine. Milling of the grains to make patent flour or other refined products robs them of much of their vitamin and mineral contents, but these can now be satisfactorily restored, as in the enriched flours and breads, enriched farina, enriched spaghetti and macaroni, and enriched corn and corn products. The additions consist of thiamine, niacin, riboflavin, and iron in amounts specified in U. S. Government standards, as shown in the accompanying table.

TABLE I

United States Government Standards (1947) for Enriched Foods

Food	*Thiamine*	*Riboflavin*	*Niacin*	*Iron*
	Milligrams per pound (minimum and maximum)			
Enriched bread	1.1-1.8	0.7-1.6	10.0-15.0	8.0-12.5
Enriched flour	2.0-2.5	1.2-1.5	16.0-20.0	13.0-16.5
Enriched farina	1.66	1.2	6.0	6.0
Enriched macaroni	4.0-5.0	1.7-2.2	27.0-34.0	13.0-16.5
Enriched corn meal	2.0-3.0	1.2-1.8	16.0-24.0	13.0-26.0
Enriched corn grits	2.0-3.0	1.2-1.8	16.0-24.0	13.0-26.0

Note: The standards for macaroni (including spaghetti) are set high to allow for losses (30-50 per cent) in cooking.

Most of the wheat flour produced in this country, all except about 10 per cent, is used for making white bread. Most of this bread, at least 80 per cent of it, is now prepared for us by commercial bakers, home baking apparently having become something of a lost art.

Modern white bread is, however, a far cry from the old-fashioned home product made from wheat flour, water, and salt, often leavened with sour dough. It is a highly supplemented product, in which the flour constitutes only about two-thirds of the total, the remainder including from 2 to 4 per cent dry skim milk solids, about 4 per cent shortening, from 1 to 2 per cent yeast, a little malt or malt extract, salt, water, and very small amounts of harmless chemical salts known as "dough conditioners." A few white breads are made with whole milk and are labeled as "milk breads."

A real whole wheat, or graham, bread must contain entirely whole wheat flour in place of the white. Such a bread is more nourishing than white bread, even the enriched, but it is much less satisfying to the average taste and it is more difficult to digest by many persons. Most of the dark breads on the market, whether wheat or rye, are mixtures of white and whole wheat flours, since these mixtures make a better loaf, with more body and taste appeal. They must be labeled as "wheat" or "rye" breads and not as whole wheat or whole rye.

Most of our commercial white breads are now enriched with vitamins and minerals. As has been stated, during World War II such enrichment was required of all bread in the United States, but the order was revoked in 1946 after the war. In twenty-two states laws provide for the compulsory enrichment of all white flour

and bread,* and in most of the others much or all of the bread is voluntarily enriched by the bakers. Consumers should insist upon having only the enriched product and should refuse any other. The label tells the story.

The usual slice of white, whole wheat, or rye bread, weighing a little less than an ounce, offers us from 65 to 70 calories. According to government standards bread must contain not more than 38 per cent moisture, although most has less. It usually has from 47 to 54 per cent carbohydrate, and 9 to 12 per cent protein, the value of which is enhanced by the presence of milk solids. When bread is toasted, some of the moisture is driven off and the starch is converted in part to dextrins and soluble starch, thus giving us a food which is carbohydrate in its most digestible form. Toasting may reduce the thiamine in enriched bread from 10 to 20 per cent, depending upon the time and temperature used.

Breakfast cereals are concocted from wheat, corn, oats, rye, rice, and barley and various combinations of them. Today, most of these cereals are either whole grain products or are restored or enriched. They are usually consumed with milk or cream and sugar, and often with fruits such as berries, raisins, and bananas, and these dishes are obviously highly nourishing. Of all cereals, oatmeal has the best nutritive properties, being rich in thiamine and other B vitamins, and in iron.

Authorities on nutrition are agreed that in normal times enriched bread and other cereal products may safely and properly comprise at least 40 per cent of the calories in the daily diet, provided that the remainder

* Alabama, Arkansas, Georgia, Indiana, Kansas, Kentucky, Louisiana, Maine, Mississippi, New Hampshire, New Jersey, New York, North Carolina, North Dakota, Oklahoma, Rhode Island, South Carolina, South Dakota, Texas, Washington, West Virginia, and Wyoming in 1947; also Hawaii and Puerto Rico.

are obtained mainly from such basic and protective foods as pure milk, eggs, fruits, green and yellow vegetables, and meats.

Sugar and Sweets

A century ago the consumption of sugar in the United States was about ten pounds per person per year, but in the 1920s this annual consumption had risen to about 100 pounds per capita. Except during periods of shortages, as in wartime, it has remained at this lofty and elevated figure. In the opinion of most competent nutritionists, but not of the sugar industry, the figure is too high.

Sugar has both advantages and disadvantages in the diet. It certainly adds flavor to other foods, making them more attractive to the palate; it has a high satiety value, because a sweet gives a feeling of satisfaction; when used in moderation it puts no great burden on the digestive tract; it is an excellent source of quick and useful food-energy; it is particularly valuable as a preservative for many foods, especially fruits. These are some of the advantages.

When sugar is consumed in excessive amounts it definitely irritates the intestinal tract and puts a strain on the kidneys. In certain forms, too much sugar is injurious to the teeth of growing children. Since sugar is 100 per cent carbohydrate and contains no proteins, vitamins, or minerals, it contributes nothing to the body but energy, and when used too profusely it tends to replace other much more nourishing foods. When added to an already adequate diet, it tends to cause obesity. These, then, are some of the disadvantages of sugar.

Most of our refined sugar is derived from the sugar cane, but a considerable portion comes from the sugar beet. Both of these types of sucrose have the same

chemical composition and the same effects. Being pure carbohydrate, it gives 113 calories to the ounce. The brown sugars are only partially refined, with a little more moisture, about 4 per cent, and some ash, but practically no vitamins. They yield about 108 calories to the ounce.

Molasses, a by-product of the sugar refining process, is by far the most nourishing of all sweets. This dark, syrupy liquid contains up to 25 per cent water and not more than 5 per cent ash, or mineral matter, which is loaded with iron and calcium.

Aside from its high content of iron, which averages about two milligrams to the ounce, molasses is a good source of the B group of vitamins. A medium molasses yields about 80 calories to the ounce. Some types are bleached with sulfur, which does them no harm.

Another natural sweetening agent which has better food value than pure sugar is honey, the product manufactured by bees from the sweet liquid gathered from the nectaries of various flowers. This nectar consists mainly of sucrose, but much of it is converted by the working bees into the invert sugars, dextrose and levulose, although about 8 per cent sucrose remains. Honey has not more than 25 per cent water, gives about 93 calories to the ounce, contains small amounts of B vitamins, a little iron, and a very small quantity of protein. It is smooth, pleasant, easily digested, and an excellent sweetening agent, but not as nourishing as molasses.

Other sugars and sweets include maple sugar, evaporated from the sap of the hard maple tree, and consisting of about 90 per cent sucrose, along with non-sugar substances which give it the characteristic color and flavor; dextrose, the simple sugar obtained from corn, grapes, and other foods; maltose, formed by conversion of the starch in malt; lactose, the sugar of milk; corn sirups and other sirups; and pure starch.

Saccharin, often used as a substitute for sugar, is a coal tar product which has no food value whatever, but is many times as sweet as sugar. It is harmless when used in moderation.

Sugar in some form, usually sucrose, is the basis of candies and confections, but they may also have a variety of other products in them, including chocolate, cocoa, nuts, fruits, milk and milk products, honey, molasses, gums, dextrose, and flavors. Plain chocolate, obtained from the beans of the cacao tree, is rich in fat, averaging about 53 per cent, along with 18 per cent carbohydrate and 6 per cent protein. It gives 173 calories to the ounce and contains considerable iron. Cocoa is skimmed or partially skimmed chocolate, averaging about 19 per cent fat, and yielding 93 calories per ounce.

Candy is a highly concentrated food, but many kinds of confectionery offer greater food value than mere energy. A reasonable amount of candy, used as a dessert and not given between meals, does no harm to children and adults and may even confer some benefits. Like other good things, it should not be eaten to excess.

Most of the soft drinks sold commercially consist of mixtures of sugar and flavoring materials in carbonated water. Most have about 10 per cent sugar and thus give about 100 calories to the glass or about 13 to the ounce. They are useful in the diet only as mild stimulants and as sources of food-energy and of desirable fluid. They should not be consumed by children at the expense of the far more nourishing milk.

Alcohol in such beverages as beer, wine, and the distilled liquors has food value in the sense that it contributes calories to the diet at the rate of about 200 to the ounce, but alcohol is also a drug, acting as a sedative and not as a stimulant. A pint of beer, with 4 per cent alcohol, gives about 200 calories, a glass of wine with 10 per cent alcohol has about 75 calories, and an

ounce of distilled liquor such as whiskey, brandy, gin, or rum yields from 75 to 85 calories. The distilled liquors generally have from 35 to 40 per cent acohol.

QUESTIONS

1. What food is properly known as our "most nearly perfect food"? ..... *See page* 233.

2. A hard cheese such as cheddar has two times ....., six times ....., nine times ....., fifteen times ....., as much calcium as milk? *See page* 236.

3. Which is the most nourishing part of the egg, the white ....., the yolk .....? Why? *See page* 236.

4. True or false?

a. All market milk should be pasteurized. ..... *See page* 234.

b. Pork may safely be eaten raw. ..... *See page* 238.

c. Goose fat has the same nutritive properties as butter. ..... *See page* 237.

d. Liver is the most nourishing of all meat products. ..... *See page* 238.

e. Seafoods are rich in iodine. ..... *See page* 239.

5. Certain nutrients predominate in certain fruits and vegetables. Match the food with the nutrient or nutrients in the following list:

Oranges	.....	1. Fat
Avocados	.....	2. Protein
Apricots	.....	3. Ascorbic acid
Romaine	.....	4. Water
Potatoes	.....	5. Vitamin A
Sweet potatoes	.....	6. Iron
Tomatoes	.....	7. Pectin
Apples	.....	8. Starch
Walnuts	.....	9. B vitamins
Peanuts	.....	
Soybeans	.....	

Answers in the text.

6. Is it better for the consumer to buy enriched white bread ....., ordinary white bread .....? *See page* 249.

7. If plenty of the basic and protective foods are included in the daily diet, whole grain and restored cereals and breads may safely comprise 10 per cent ....., 20 per cent ....., 40 per cent ....., 60 per cent ....., 80 per cent ....., of your calories? *See page* 250.

8. What are the advantages and disadvantages of sugar in the diet? *See page* 251.

CHAPTER 19

Making the Best Use of Food

"THROUGH DIET a new level of health can be attained, enabling man to develop inherited capacities to the fullest extent."

These words are the joint pronouncement of the world's leading authorities on nutrition, who assembled in 1943 at Hot Springs, Virginia for a noteworthy conference on food and agriculture, held under the auspices of the United Nations.

The practical significance of nutrition on human affairs was summarized and epitomized by this conference in these words:*

"1. The kind of diet which man requires for health has been established.

"2. Investigations in many parts of the world have shown that the diets consumed by the greater part of mankind are nutritionally unsatisfactory.

"3. Diets which do not conform with the principles of satisfactory nutrition lead to impaired physical development, ill-health, and untimely death.

"4. Through diet a new level of health can be attained, enabling man to develop inherited capacities to the fullest extent."

That last statement is worth the repetition. In order to achieve this promised new level of health it is essential for everyone to know, understand, and appreciate

* United Nations Conference Report on Food and Agriculture. Final Act and Section Reports. U. S. Department of State. 1943.

the established principles of human nutrition, as already set forth in this book, but more than that, it is essential to apply them in a practical manner to the difficult business of living.

Those who are fortunate enough to enjoy a relatively high economic status should have no trouble in making the best use of food, although they often do have such trouble. When the food budget is restricted, as so many are, it is nevertheless still possible to make an intelligent application of accepted dietary principles. It is usually possible to eat wisely on limited funds, provided that they are not limited to the point of poverty.

The Economy of Eating

The prices of foods depend upon a number of factors, such as the supply and abundance of a particular food, its quality, and its availability on the local market. When purchasing the family food supply the homemaker should consider these factors, along with one other, the nutritive properties of the food.

High priced foods are not necessarily any more nourishing than cheaper foods. Thus, the cheaper cuts of meat offer the same protein values and other nutrients as the more expensive. These cheaper cuts may be somewhat tougher and less flavorful, but they can be tenderized in various ways and they can be cooked so as to make them attractive.

Here is another example. The older hens known as fowls, which are no longer valuable for laying eggs, are always cheaper than chicken. They have the same food value as the younger, more tender birds, and they can be prepared by boiling, roasting, and stuffing so as to make them most palatable.

When ducks are plentiful on the market they are usually much cheaper than other poultry. They have

the same food values as chicken. Their dark meat is tender and flavorful, and they are excellent buys.

Certain kinds of liver are generally much more expensive than others, and yet the cheaper grades of liver offer virtually the same amounts of iron and vitamins per ounce as the more costly types.

The highest price is usually put on the large, firm, white fresh egg. And yet, brown eggs and small eggs and cold storage eggs all have almost exactly the same nutritive properties as the freshly laid white egg. Some of the cheaper, older eggs may not produce as attractive an omelet or boiled or coddled egg, but they are excellent in scrambled eggs or in other cooked foods, yielding many precious nutrients.

Margarine fortified with vitamin A generally costs less than half as much as butter. This white product, white because of discriminatory legislation, has virtually the same food value as the best butter, which varies somewhat in its content of vitamin A. Margarine can be employed for all of the same purposes as butter, with substantial savings.

Canned foods are often cheaper than fresh foods, although their prices vary. The canned foods usually offer the same dietary values as the same fresh food cooked in the home, and in some instances offer greater food values than those so-called fresh foods which have been stored too long, or have been abused by poor cooking.

The grade B and lower grade canned foods may not have the same attractive appearance as the grade A, but they have the same food values, as a rule, and at lower costs.

Certain foods are always economical, more or less, regardless of price. The costs may go up somewhat, but you get more on your investment in the way of nutrition from some foods than from others. In this

category are enriched bread and cereals, the cheapest sources of necessary food-energy. Also in this group is pure milk, the best all-around food for the money. The less expensive grades of pasteurized fluid milk give you virtually the same nutrients as the luxury milks.

It is, furthermore, possible to save on the family milk bill by using the canned evaporated milks, which are much cheaper than the fluid market milks. When reliquefied with an equal portion of pure water, evaporated milk produces a fluid milk which is pure and safe, easily digested, and very nearly equivalent to whole milk in nutritive properties. It lacks vitamin C, which is not abundant in any kind of milk, and it has suffered some slight loss of thiamine, which can be obtained in a well-rounded diet in sufficient quantities to make up this small loss.

In order to provide adequate nutrition for the family at reasonable cost, it has been suggested by a leading authority on nutrition, Professor Henry C. Sherman of Columbia University, that the food budget be divided into fifths, as follows:—

One-fifth, more or less, for vegetables and fruit;
One-fifth, or more, for milk and cheese;
One-fifth, or less, for meats, fish, and eggs;
One-fifth, more or less, for bread and cereals;
One-fifth, or less, for fats, sugar, and other groceries and food adjuncts.

Nutritional authorities have also proposed that all low-income families should be provided, possibly through government assistance, with the following essential foods per person per week:

Pure milk, 5 quarts
Potatoes and sweet potatoes, 4 pounds
Dry beans, peas, and nuts, 8 ounces
Tomatoes and citrus fruits, 1½ pounds

Green and yellow vegetables, 1½ pounds
Other vegetables and fruits, 2 pounds, 5 ounces
Eggs, 4 eggs
Meat, poultry, and fish, 1½ pounds
Flour and cereals, 4 pounds, 7 ounces
Fats and oils, 14 ounces
Sugars, sirups, and preserves, 12 ounces.

The economy of eating can be enhanced by the home production of foods. Growing your own food, particularly vegetables and fruits, in your own garden not only gives satisfaction and promotes healthful exercise in the fresh air and sunlight, but makes a substantial contribution to good nutrition and the attractiveness of meals. Any suburban or rural dweller who has a little plot of ground will find it to his advantage to raise a few crops and perhaps some chickens and eggs. The long drawn out battle of the peace needs as many victory gardens as did the war years.

Attractive Meals

When meals are well planned and attractive they confer greater benefits on the eater than do those which are poorly selected, improperly cooked, and sloppily served. Attractive meals are those which have variety, color, and palatability, as well as nutritive virtues. It is the duty of the homemaker to make them attractive, and it should be a pleasure to do so. It is likewise the duty of the family to appreciate the efforts of the housewife and to praise success when it is achieved.

Meals should be planned not as single units but as part of the family food supply for the entire day and even the entire week. Assistance in meal planning can be obtained from suggestions given in the women's pages of newspapers, in household magazines, and in good cook books, as well as from the ingenuity and experience of the homemaker herself. Other members of the family

may also have some good ideas, too, which should never be scorned.

Although some meals, such as breakfast, may follow an accepted and acceptable pattern, no one meal should have too striking a preponderance of a particular type of food. The protein, fat, and carbohydrate should be well distributed. For example, meat and chicken salad or fish do not belong in the same meal, nor do potatoes and rice or macaroni and too much bread. It is not a good policy to serve tomato soup, followed by tomato salad and tomatoes as the vegetable with the meat.

A few staple foods, such as bread and butter, milk, coffee, and sugar and salt may belong in every meal, but other foods should be varied, or they will become too monotonous. Thus, white potatoes may be served at lunch, but some other solid vegetable or starchy food may well replace potatoes at dinner. The left-over potatoes may be used the next day, possibly in some other form than previously used.

Contrasts in food add to the pleasure of the meal. A bland appetizer may be followed by a heavier and more highly flavored course, followed in turn by a crisp salad and a sweet dessert. If one green vegetable is served, it is better not to serve another at the same meal, except possibly in a mixed green salad.

The food-energy of the meals should be reasonably well distributed throughout the day, rather than given sparsely at two meals and concentrated in the third. One very heavy meal and two light ones are not as physiologically sound as three moderate ones. Similarly, a lot of heavy foods which are difficult to digest should not be massed in one meal.

Concentrated foods, such as cheese, should be served in small portions or with other foods that dilute them. Cheese, a rich source of excellent protein, goes well with macaroni, a starchy food high in food-energy. Nuts,

rich in fat, may be grated and used with fruits or on salads, or in the form of nut butters and pastes for spreads on bread.

Garnishes, such as lemon with fish, parsley with potatoes, sauces on meats and vegetables, catsup and spices in moderation, often add to the attractiveness of meals. Most of the garnishes should be eaten and not employed merely for decorative purposes. Parsley and watercress, for instance, are high in certain vitamins and minerals.

Color makes meals more attractive, and often perks up jaded appetites. A red tomato soup with crisp white crackers, followed by a brown meat with yellow sweet potatoes, white bread, a green salad, and a chocolate dessert with a red cherry nestling in whipped cream is a colorful, flavorful, and nourishing meal. There is, of course, an infinite variety of color combinations, which may add to the esthetic value and allure of the meal.

It should be borne in mind, however, that an artistic meal is not necessarily a nourishing or balanced one. Such a simple combination as a robust bowl of graham crackers and milk is highly nutritious but not necessarily inspiring to look at. On the other hand, it is always possible to combine attractiveness with good nutrition, and it generally pays to do so.

Needless to say, all dishes and utensils employed in the service of food should be scrupulously clean. Wherever possible, they should also be sound and free from defects. Tables should be set in the proper manner and the meal served and consumed with some degree of reasonable etiquette. Flowers on the table often add to the enjoyment of meals, and some people like a little soft music when they eat. If these adjuncts make the meal more attractive, there is no reason why they should not be indulged in. After all, eating should be a real pleasure, as well as something that is conducive to health.

Needless to say, too, as it has been said previously every meal should be a pleasant and cheerful occasion, free from argument, bickering, irritation, and raucous noise. Digestion proceeds best when the mind is calm and serene, and food tastes better under such conditions.

Home Care of Food

Proper care of food in the home prevents waste and avoids the dangers of food poisoning. Most foods are perishable and will spoil rather quickly if not kept cold or otherwise protected. Some foods, such as fresh fish and shellfish, ground meats, cream and custard sauces, and eggs, will deteriorate more rapidly than others, especially during hot weather. These foods and many others should never be permitted to stand for any length of time at room temperature.

Spoilage of foods is due to the action of micro-organisms, which grow best under conditions of warmth and moisture. Changes in foods are also brought about by the action of the chemical substances known as enzymes which are present in most foods. These bacteriological and chemical actions are inhibited when foods are kept cold and protected from invasion by germs, molds, and other parasites.

All perishable foods must, therefore, be properly refrigerated if they are to be stored for some time. The temperature inside the refrigerator or ice box should be not more than 50 degrees Fahrenheit for satisfactory results. The refrigerator should be maintained in a clean and sanitary condition, and if of the electric type should be defrosted regularly.

Many vegetables can be stored during the winter months without benefit of refrigeration. Thus, potatoes, cabbage, parsnips, carrots, and such fruits as winter apples and pears can be kept for months if they are

stored in moist, dark, well-ventilated places, such as cellars, closets, or outdoor pits. Strongly flavored vegetables like cabbage and turnips are best kept outside.

Dry beans, peas, and onions require dry, cool storage, while pumpkins, winter squash, and sweat potatoes keep best in dry and slightly warm places, such as a garage.

Products that can not be stored for long include tomatoes, peaches, melons, summer squash, eggplant, and peppers. Some of these should be preserved by canning, and then put away in cool, dry storage.

A useful pamphlet on home storage of vegetables and fruits can be obtained without charge from the United States Department of Agriculture, Washington, D. C. It is Farmers Bulletin No. 1939.

Mold sometimes occurs on foods such as bread, jams and jellies, meats, and others. If the mold is merely on the surface and has not penetrated the food, it can be scraped off and the food may be consumed without danger. Mold is, in fact, a normal constituent of some foods, such as certain types of cheeses. Cleanliness in the bread box and avoidance of moisture will prevent mold on this particular food, which may, incidentally, be put in the refrigerator if desired.

In the summer time great care must be taken with all cream- and custard-filled goods, whether prepared at home or purchased in the bakery. These soft fills are ideal culture media for bacteria if they are kept under warm, moist conditions. They should be consumed promptly and placed under refrigeration between meals. A number of unfortunate outbreaks of food-poisoning have been caused by improperly kept cream-filled baked goods, and many health departments do not permit them to be sold at all during the hot summer months.

When foods are prepared for community suppers or picnics they should never be allowed to stand overnight in a warm room, and they should never, of course, be

prepared by anyone who is suffering from any kind of disease or malady. Church suppers have been responsible for a considerable number of cases of food-poisoning, which could have been easily prevented by proper precautions.

School lunches and workers' lunches are best made up in the morning of the day they are to be eaten. If conditions require that they be prepared the night before, they should be carefully refrigerated. In hot weather they should be packed in waxed paper and placed in lunch boxes of substantial construction.

It should always be remembered that hygiene in the home is just as important as sanitation in the community.

Proper Cooking

Cooking of foods has hygienic, esthetic, and psychological values, provided that it is done correctly. It destroys organisms which are present to some extent in virtually all fresh foods, it destroys or reduces the action of enzymes, it makes the food more tender and palatable, it brings out flavors, and it adds to the enjoyment of eating.

Proper methods of cooking individual foods are outlined in all good cook books, and are beyond the scope of this book. There are, however, one or two principles that should be borne in mind when cooking to preserve as much as possible of the nutritive values of the foods. Vitamins may be lost if the food are overcooked in the presence of too much air, and minerals will be lost if too much water is employed, and then discarded.

Vegetables should be cooked in covered containers in a minimum of water for as short a time as is possible. Soda should not be added in appreciable quantities, although a pinch (⅛ teaspoon) may do no harm and

will help to preserve the natural color of the vegetable.

Foods may be safely cooked in any kind of a utensil except copper, which has a catalytic action and causes greater destruction of certain vitamins, particularly ascorbic acid. Stainless steel, aluminum, iron, tin, and crockery are all equally valuable in preserving nutrients under proper methods of cooking.

There is no danger whatever in the use of aluminum for the cooking or storage of foods, despite a certain amount of prejudice which has been created against this metal, chiefly by its competitors. Even if the food should pick up a trifling amount of aluminum it would do no harm whatever, and will definitely not cause cancer, as has sometimes been alleged by the ignorant or unscrupulous.

Use of the modern pressure cooker is an excellent method of retaining vitamin and mineral values in foods, since this device generally employs a minimum of water and is rapid. There are many types of pressure cookers, some of which are better and safer than others. In using them, be sure that all working parts are in order, and then follow the directions of the manufacturer.

The most common methods of cooking are boiling, steaming, baking, roasting, broiling, and frying. The important thing in all of them is to avoid overcooking, and sometimes undercooking. Pork, for example, must always be thoroughly cooked in order to avoid any possibility of infection from the trichina which occasionally infest this raw meat. Most foods, however, suffer from overcooking, which makes them watery or mushy, or tough and dry, or flat and insipid in taste, depending upon the nature of the food.

Cooking is both an art and a science. It should also be a pleasant task, although too many persons regard it as a chore. American cooking has been severely criticized, but the best of our cooking is the equal of any

in the world and far better than that in some other countries.

QUESTIONS

1. If you must economize on food, which of each of the following pairs of foods would you buy in order to obtain adequate nourishment?

Fluid whole milk .....
Canned evaporated milk .....

Butter .....
Fortified margarine .....

Fresh large white eggs .....
Small brown cold storage eggs .....

Chicken .....
Fowl .....

Calf's liver .....
Beef liver .....

Grade A canned peas .....
Grade B canned peas .....

Sirloin steak .....
Pot roast .....

Answers on page 258

2. Complete the following statements:
Divide your food budget into fifths,
One-fifth, more or less, for .....
One-fifth, or more, for .....
One-fifth, or less, for .....
One-fifth, more or less, for .....
One-fifth, or less, for .....

See page 259.

3. Give at least three reasons why all meals should be attractive, well-served, and pleasant. *See page* 260.

4. What are the objections to the following meal?

Spaghetti
French fried potatoes
Bread
Coffee with sugar
Angel food cake

Answer on page 261.

5. What is the proper temperature for storage of perishable foods in your refrigerator 70 degrees F. ....., 60 ....., 50 ....., 20 ..... ? *See page* 263.

6. Which vitamin is lost if milk is exposed to sunlight? Vitamin A ....., thiamine ....., riboflavin ....., folic acid. ..... *See page* 52.

7. Which of the following metals is undesirable in utensils employed in cooking vegetables:

Aluminum	.....
Stainless steel	.....
Copper	.....
Tin	.....
Iron	.....
Brass	.....

Answers on page 266.

8. Outline the proper methods for cooking foods so as to retain their nutrients. *See page* 266.

BIBLIOGRAPHY

In my personal library are approximately one hundred books on food, nutrition, and diet, as well as several hundred pamphlets and brochures on these subjects. Some of these are now of historical interest only.

The following are the texts which I have found most useful in the preparation of this book, and have consulted freely. Most of them are of a technical nature, somewhat beyond the comprehension and interest of the average lay consumer.

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Tables of Food Composition in terms of Eleven Nutri-

APPENDIX I

RECOMMENDED DIETARY ALLOWANCES, REVISED 1945[1]

(Amounts Per Day)

Food and Nutrition Board, National Research Council

	Calories	Protein grams	Calcium grams	Iron mg.	Vitamin A I. U.[2]	Thiamine mg.[3]	Riboflavin mg.[3]	Niacin (Nicotinic acid) mg.[3]	Ascorbic acid mg.	Vitamin D I. U.
Man (154 lb., 70 kg.)										
Sedentary	2500	70	0.8	12[4]	5000	1.2	1.6	12	75	[5]
Moderately active	3000	70	0.8	12[4]	5000	1.5	2.0	15	75	[5]
Very active	4500	70	0.8	12[4]	5000	2.0	2.6	20	75	[5]
Woman (123 lb., 56 kg.)										
Sedentary	2100	60	0.8	12	5000	1.1	1.5	11	70	[5]
Moderately active	2500	60	0.8	12	5000	1.2	1.6	12	70	[5]
Very active	3000	60	0.8	12	5000	1.5	2.0	15	70	[5]
Pregnancy (latter half)	2500[6]	85	1.5	15	6000	1.8	2.5	18	100	400 to 800
Lactation	3000	100	2.0	15	8000	2.0	3.0	20	150	400 to 800
Children up to 12 yrs.[7]:										
Under 1 yr.[8]	100/2.2 lb. (1 kg.)	3.5/2.2 lb. (1 kg.)	1.0	6	1500	0.4	0.6	4	30	400 to 800
1–3 yrs. (29 lb., 13 kg.)	1200	40	1.0	7	2000	0.6	0.9	6	35	400
4–6 yrs. (42 lb., 19 kg.)	1600	50	1.0	8	2500	0.8	1.2	8	50	400
7–9 yrs. (55 lb., 25 kg.)	2000	60	1.0	10	3500	1.0	1.5	10	60	400
10–12 yrs. (75 lb., 34 kg.)	2500	70	1.2	12	4500	1.2	1.8	12	75	400
Children over 12 yrs.[7]:										
Girls, 13–15 yrs. (108 lb., 49 kg.)	2600	80	1.3	15	5000	1.3	2.0	13	80	400
16–20 yrs. (119 lb., 54 kg.)	2400	75	1.0	15	5000	1.2	1.8	12	80	400
Boys, 13–15 yrs. (103 lb., 47 kg.)	3200	85	1.4	15	5000	1.5	2.0	15	90	400
16–20 yrs. (141 lb., 64 kg.)	3800	100	1.4	15	6000	1.8	2.5	18	100	400

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The following footnotes refer to the table of Recommended Dietary Allowances on the opposite page.

[1] Tentative goal toward which to aim in planning practical dietaries; can be met by a good diet with a variety of natural foods. Such a diet will also provide other minerals and vitamins, the requirements for which are less well known.

[2] The allowance depends on the relative amounts of vitamin A and carotene. The allowances of the table are based on the premise that approximately two-thirds of the vitamin A value of the average diet in this country is contributed by carotene and that carotene has half or less than half the value of vitamin A.

[3] For adults (except pregnant and lactating women) receiving diets supplying 2,000 calories or less, such as reducing diets, the allowances of thiamine, riboflavin, and niacin may be 1 mg., 1.5 mg., and 10 mg. respectively. The fact that figures are given for different calorie levels for thiamine, riboflavin, and niacin does not imply that we can estimate the requirement of these factors within 500 calories, but they are added merely for simplicity of calculation. Other members of the B complex also are required, though no values can be given. Foods supplying adequate thiamine, riboflavin, and niacin will tend to supply sufficient of the remaining B vitamins.

[4] There is evidence that the male adult needs little or no iron. The allowance will be provided if the diet is satisfactory in other respects.

[5] For persons who have no opportunity for exposure to clear sunshine and for elderly persons, the ingestion of small amounts of vitamin D may be desirable. Other adults probably have little need for vitamin D.

[6] During the latter part of pregnancy the allowance should increase approximately 20 per cent over the preceding level. The value of 2,500 calories represents the allowance for pregnant, sedentary women.

[7] Allowances for children are based on the needs for the middle year in each group (as 2, 5, 8, etc.) and are for moderate activity

and for average weight at the middle year of the age groups.

[8] Needs of infants increase from month to month with size and activity. The amounts given are for approximately 6 to 8 months. The dietary requirements for some of the nutrients such as protein and calcium are less if derived largely from human milk.

Further Recommendations:

FAT. There is available little information concerning the human requirement for fat. Fat allowances must be based at present more on food habits than on physiological requirements. While a requirement for certain unsaturated fatty acids (the linoleic and arachidonic acids of natural fats) has been amply demonstrated with experimental animals, the human need for these fatty acids is not known. In spite of the paucity of information on this subject there are several factors which make it desirable that fat be included in the diet to the extent of at least 20 to 25 per cent of the total calories and that the fat intake include "essential" unsaturated fatty acids to the extent of at least 1 per cent of the total calories. At higher levels of caloric expenditure, e.g., for a very active person consuming 4,500 calories and for children and adolescent persons, it is desirable that 30 to 35 per cent of the total calories be derived from fat. Since foodstuffs such as meat, milk, cheese, and nuts may be expected to contribute "invisible" fat to the extent of from one-half to two-thirds of the total amounts of fat implied by the above proportions of the total calories, it is satisfactory to use separated or "visible" fats such as butter, margarine, lard, and shortenings only to the extent of one-third to one-half of the amounts indicated.

COPPER. The requirement for copper for adults is about 1 to 2 mg. daily. Infants and children require approximately 0.05 mg. for each kilogram of body weight. The requirement for copper is approximately one-tenth that for iron. A good diet normally will supply sufficient copper.

IODINE. The requirement for iodine is small, probably about 0.002 to 0.004 mg. daily for each kilogram of body weight, or a total of 0.15 to 0.30 mg. daily for the adult. This need is met by the regular use of iodized salt; its use is especially important in *adolescence* and *pregnancy*.

PHOSPHORUS. Available evidence indicates that the phosphorus allowances should be at least equal to those for calcium in the diets of children and of women during the latter part of pregnancy and during lactation. In the case of other adults the phosphorus allowances should be approximately 1.5 times those for calcium. In general it is safe to assume that if the calcium and protein needs are met through common foods, the phosphorus requirement also will be covered, because the common foods richest in calcium and protein are also the best sources

of phosphorus.

VITAMIN K. The requirement for vitamin K usually is satisfied by any good diet. Special consideration needs to be given to new-born infants. Physicians commonly give vitamin K either to the mother before delivery or to the infant immediately after birth.

SALT. The needs for salt and for water are closely interrelated. A liberal allowance of sodium chloride for the adult is 5 grams daily, except for some persons who sweat profusely. The average normal intake of salt is 10 to 15 grams daily, an amount which meets the salt requirements for a water intake up to 4 liters daily. When sweating is excessive, one additional gram of salt should be consumed for each liter of water in excess of 4 liters daily. With heavy work or in hot climates 20 to 30 grams daily may be consumed with meals and in drinking water. Even then, most persons do not need more salt than usually occurs in prepared foods. It has been shown that after acclimatization persons produce sweat that contains only about 0.5 gram to the liter in contrast with a content of 2 to 3 grams for sweat of the unacclimatized person. Consequently after acclimatization, need for increase of salt beyond that of ordinary food disappears.

WATER. A suitable allowance of water for adults is 2.5 liters daily in most instances. An ordinary standard for diverse persons is one milliliter for each calorie of food. Most of this quantity is contained in prepared foods. At work or in hot weather, requirements may reach 5 to 13 liters daily. Water should be allowed *ad libitum*, since sensations of thirst usually serve as adequate guides to intake except for infants and sick persons.

APPENDIX II

Composition of Common Foods with Calories per Ounce

The following data, taken mainly from U.S. Government publications, show the percentages of water, protein, fat, and carbohydrate in most of our common foods. For the convenience of the housewife the food-energy values of the various foods are given in calories per ounce by weight, instead of in calories per 100 grams, as is usual in such tables.

For portions of foods giving 100 calories the table in Chapter 7 on page 113 may be consulted.

Food	*Water* %	*Protein* %	*Fat* %	*Carbohydrate* %	*Calories per ounce*
Almonds	4.7	18.6	54.1	19.6	180
Apples	84.1	0.3	0.4	14.9	18
Apricots	85.4	1.0	0.1	12.9	16
Apricots, dried	24.0	5.2	0.4	66.9	80
Asparagus	93.0	2.2	0.2	3.9	7
Avocado	65.4	1.7	26.4	5.1	62
Bacon	20.0	9.1	65.0	1.1	176
Bananas	74.8	1.2	0.2	23.0	28
Barley, pearled	11.1	8.2	1.0	78.8	100
Beans, lima	66.5	7.5	0.8	23.5	35
Beans, kidney, dried	11.0	22.0	1.5	62.1	100
Beans, string	89.0	2.4	0.2	7.7	12
Beef, round, lean	67.0	20.0	13.0	..	44
Beet greens	90.0	2.0	0.3	5.6	9
Beets	87.6	1.6	0.1	9.6	13
Blackberries	85.0	1.2	1.1	12.0	18
Blueberries	83.4	0.6	0.6	15.1	19
Bluefish	74.0	21.0	4.0	..	25

Food	*Water* %	*Protein* %	*Fat* %	*Carbo-hydrate* %	*Calories per ounce*
Bread, white	36.0	8.5	2.0	52.3	73
Bread, whole wheat	37.0	9.5	3.5	48.0	73
Broccoli	90.0	3.3	0.2	5.5	10
Brussels sprouts	85.0	4.4	0.5	8.9	16
Butter	15.5	0.6	81.0	0.4	208
Buttermilk	90.0	3.5	0.1	5.1	10
Cabbage	92.4	1.4	0.2	5.3	9
Cantaloupe	94.0	0.6	0.2	4.6	8
Carrots	88.2	1.2	0.3	9.3	13
Cauliflower	92.0	2.4	0.2	4.9	9
Celery	93.7	1.3	0.2	3.7	6
Chard	92.0	1.4	0.2	4.4	7
Cheese, American	39.0	24.0	32.3	1.7	125
Cheese, cottage	74.0	19.2	0.8	4.3	31
Cheese, cream	53.3	7.1	37.0	1.7	109
Cherries	79.0	1.1	0.5	17.8	22
Chicken	66.0	22.0	12.6	..	31
Chocolate, unsweetened	2.3	5.5	53.0	18.0	173
Clams	81.0	12.8	1.4	3.4	22
Cocoa powder	4.3	9.0	18.8	31.0	93
Coconut, dry	3.3	3.6	39.0	53.2	162
Cod	82.6	16.5	0.4	..	22
Collards	86.6	3.9	0.6	7.2	14
Corn, fresh	74.0	3.7	1.2	20.5	29
Corn meal, yellow	12.0	9.1	3.7	73.9	102
Crackers, graham	5.5	8.0	10.0	74.3	119
Crackers, soda	4.5	9.5	10.3	72.7	117
Cranberries	88.0	0.2	0.4	11.3	13

Food	*Water* %	*Protein* %	*Fat* %	*Carbo-hydrate* %	*Calories per ounce*
Cream, light	72.5	2.9	20.0	4.0	58
Cream, heavy	55.0	2.2	40.0	3.2	108
Cucumbers	96.1	0.7	0.1	2.7	4
Dandelion greens	85.8	2.7	0.7	8.8	15
Dates	21.0	2.2	0.6	75.4	100
Eggplant	92.7	1.1	0.2	5.5	8
Eggs, whole	74.0	12.8	11.3	0.7	42
Egg yolk	49.4	16.3	31.9	0.7	100
Farina	11.0	11.5	1.0	76.1	100
Fish, medium fat	77.2	19.0	2.5	..	27
Flour, white	12.0	10.8	0.9	76.0	100
Flour, whole wheat	11.0	13.0	2.0	72.4	100
Grapefruit	88.8	0.5	0.2	10.0	13
Grapes	81.6	0.8	0.4	16.7	22
Ham, fresh	53.0	15.2	31.0	..	95
Ham, smoked	42.0	16.9	35.0	..	107
Honey	20.0	0.3	..	79.5	90
Ice cream, plain	62.0	4.0	12.3	20.8	59
Kale	86.6	3.9	0.6	7.2	14
Lamb, roast	63.7	18.0	17.5	..	64
Lard	..	..	100.0	..	255
Lemons	89.3	0.9	0.6	8.7	12
Lettuce	94.8	1.2	0.2	2.9	5
Limes	86.0	0.8	0.1	12.3	15
Liver	71.0	19.8	4.2	3.6	37
Macaroni	11.0	13.0	1.4	74.0	100
Maple sirup	33.2	..	..	66.0	83
Margarine	15.5	0.6	81.0	0.4	208
Mayonnaise	16.0	1.5	78.0	3.0	202
Milk, condensed	27.0	8.1	8.4	54.8	94
Milk, dry whole	3.5	25.8	26.7	38.0	144

Food	*Water* %	*Protein* %	*Fat* %	*Carbo-hydrate* %	*Calories per ounce*
Milk, dry skim	3.5	35.6	1.0	52.0	100
Milk, evaporated	73.7	7.0	7.9	10.0	40
Milk, whole fluid	87.0	3.5	3.9	5.0	20
Molasses	24.0	..	..	60.0	81
Mushrooms	..	..	0.3	..	1
Oatmeal	8.3	14.2	7.4	68.2	113
Okra	90.0	1.8	0.2	7.4	11
Olives	75.2	1.5	13.5	4.0	36
Onions	87.5	1.4	0.2	10.3	14
Oranges	87.2	0.9	0.2	11.2	14
Oysters	87.1	6.0	1.2	3.7	23
Parsnips	78.6	1.5	0.5	18.2	24
Peaches	86.9	0.5	0.1	12.0	14
Peaches, dried	24.0	3.0	0.6	69.4	88
Peanuts	2.6	27.0	44.2	23.6	155
Peanut butter	1.7	26.1	47.8	21.0	171
Pears	82.7	0.7	0.4	15.8	18
Peas, green	74.3	6.7	0.4	17.7	28
Peas, dried	10.0	24.5	1.2	61.7	100
Pecans	3.0	9.4	73.0	13.0	208
Peppers, green	92.4	1.2	0.2	5.7	8
Pineapple, fresh	85.3	0.4	0.2	13.7	16
Plums	85.7	0.7	0.2	12.9	16
Pork, medium	42.0	12.0	45.0	..	127
Potatoes, sweet	68.5	1.8	0.7	27.9	35
Potatoes, white	77.8	2.0	0.1	19.1	24
Prunes, dried	24.0	2.3	0.6	71.0	86
Pumpkin	90.5	1.2	0.2	7.3	10
Radishes	93.6	1.2	0.1	4.2	8
Raisins	24.0	2.3	0.5	71.3	84

Food	*Water* %	*Protein* %	*Fat* %	*Carbo-hydrate* %	*Calories per ounce*
Rhubarb	94.9	0.5	0.1	3.8	5
Rice	12.3	7.6	0.3	79.4	100
Rutabagas	89.1	1.1	0.1	8.9	12
Salad oil	..	..	100.0	..	255
Salmon, canned	67.4	20.6	9.6	..	48
Sardines, in oil	47.1	21.1	27.0	1.0	59
Sauerkraut	93.2	1.1	0.2	3.4	8
Sausage, pork	57.0	16.0	24.0	..	78
Shrimp, canned	78.3	17.8	0.8	0.8	23
Spinach	92.7	2.3	0.1	3.2	7
Squash, summer	95.0	0.6	0.1	3.9	5
Squash, winter	88.6	1.5	0.3	8.8	12
Strawberries	90.0	0.8	0.6	8.1	11
Sugar, brown	3.0	..	..	95.5	108
Sugar, granulated	0.5	..	..	99.5	113
Tapioca	12.6	0.6	0.2	86.4	100
Tomatoes	94.1	1.0	0.3	4.0	6
Tongue	68.0	16.4	15.0	0.4	57
Tuna fish, canned	51.4	23.9	22.1	..	55
Turkey, medium	55.3	20.1	20.2	..	73
Turnips	91.0	1.1	0.2	7.1	10
Veal, medium	68.0	19.1	12.0	..	52
Walnuts	3.3	15.0	64.4	15.6	200
Watermelon	92.1	0.5	0.2	6.9	9
Wheat germ	11.0	25.2	10.0	49.5	114
Yeast, dried brewer's	7.0	46.1	1.6	37.4	100

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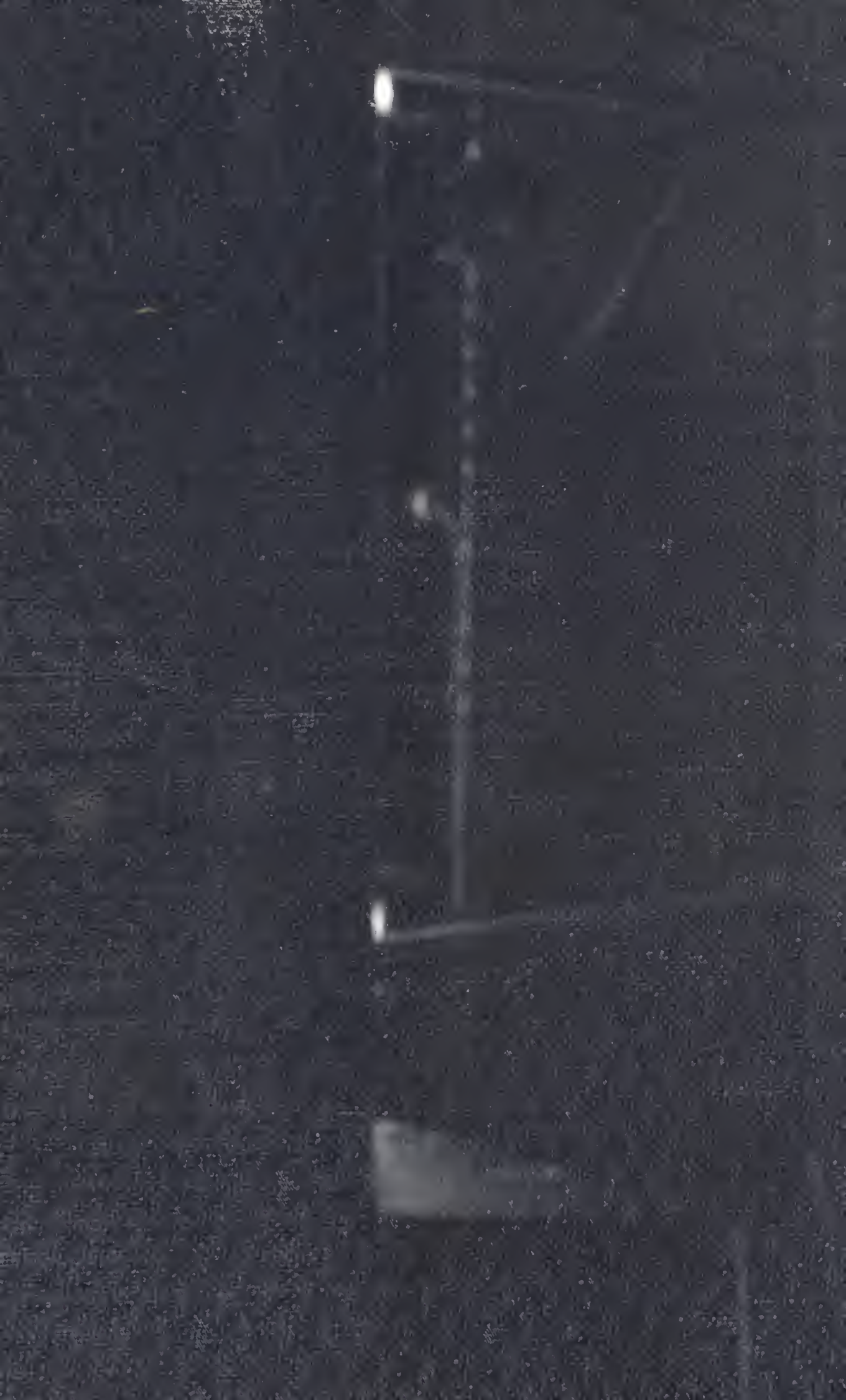
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